CLEAN AIR

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CLEAN AIR

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POLLUTION REPORT NUMBER 4

Pollution Report Number 4 has the title *Digest of Environmental Pollution Statistics*. It has been produced by the Government Statistical Service on behalf of the Department of the Environment and is published by HMSO at £3.25.

The main subjects covered are air, fresh water and marine pollution, noise and waste; but there are also supplementary information and statistics concerning climate, population, energy, water supply, transport and public opinion. The question asked in the survey of public opinion was 'One of the problems concerning many people today is pollution of the environment. What types of pollution - if any - do you personally feel concerned about?' Air pollution came a very close second as the problem with which most people were concerned; (39 per cent overall as against a 40 per cent concern about water pollution). Of the people who thought air pollution the most serious problem, some 70 per cent complained about pollution from vehicle exhausts, some 46 per cent about smoke from factories and 15 per cent about rubbish and rubbish dumps. Lorries, buses and cars accounted for 56 per cent of the complaints about noise pollution, although only 11 per cent of those surveyed thought that noise was the most worrying form of environmental pollution.

The tables concerned with air pollution - smoke, sulphur dioxide, pollution from road vehicles, grit and dust and radioactive fall-out - give emission, concentration and abatement statistics, generally and usefully as trends. Other sections are equally comprehensive. The statistics about noise, for example, are particularly illuminating - and in some cases disturbing.

We think that this is one of the best publications that the Government have produced in recent times as it provides figures and references which are essential to anyone concerned with the cause of clean air and the environment. We hope that the book will be widely used for reference.

One of the great difficulties these days is the provision of factual information which will help to create an informed public opinion. Too many people base their arguments on hearsay and rumour. Pollution Report Number 4 provides the actual facts and figures for all to use. Obviously it does not contain information about everything that everyone would wish. No doubt there will be additional tables and additional figures included in future editions, should this edition of the *Digest* prove to be successful. But we expect that this publication will be an invaluable resource for those people who, like the members of our Society, are trying to tell the truth about pollution.

We welcome the publication of this book and recommend it unhesitatingly to all our readers. For those who, for one reason or another, are unable to obtain their own copy, the report may be borrowed from the Society's library.

Clean Air Re-Numbered

Former issues of *Clean Air,* Volumes 1-8, have been numbered consecutively, 1-31, although entitled 'Spring', 'Summer', 'Autumn' and 'Winter' as appropriate year by year.

Now, the new look *Clean Air* will appear six times a year, so the former quarterly numbers are no longer appropriate. It has been decided to start afresh with Nos. 1-6 within each volume (year). This first issue is therefore numbered Vol. 9, No. 1. No. 2 will appear at the end of April, and so on through to No. 6 which will be issued in December.

NEWS FROM THE DIVISIONS

NORTHERN IRELAND DIVISION

An open meeting of the Northern Ireland Division of the Society was held on Thursday, 9th November, 1978, in the Group Theatre, Belfast. Belfast City Council most generously placed the theatre at the disposal of the Division and the meeting was the first to be held there following extensive renovation.

There was a good attendance from local and central government and from the fuel industry. Mr. R. Campbell Brown, Chairman of the Division, introduced the guest speaker, Rear Admiral P. G. Sharp, Secretary General of the Society.

The Secretary General gave a paper on air pollution controls in which he considered the development and progress of the clean air cause and pointed out the comparative state of play in Great Britain and in Northern Ireland. In a very wide-ranging paper the speaker reported on the European and indeed world-wide approach to pollution control, discussing a number of sources including motor vehicle emissions. Admiral Sharp considered the future and speculated on how the control of air pollution might be developed over the next few years.

At the conclusion of the paper a number of delegates took part in a discussion and the Secretary General dealt with questions from the floor. Mr. J. Stanley Gardiner (Shell), vice-chairman of the Division, in proposing a vote of thanks to Admiral Sharp, shared some personal memories of previous visits to Belfast of our speaker, notably to take command of a ship, and invited those present to express their appreciation. The warm way in which this was done demonstrated the feelings of the meeting.

DIARY OF EVENTS

9, 10 and 11 April Workshop on Pollution from Road Vehicles, Warwick University, Coventry.

10 May (Thursday)
p.m. General Purposes and Finance Committee Meeting, London.

31 May (Thursday)
p.m. Meeting of the Council of the Society, London.

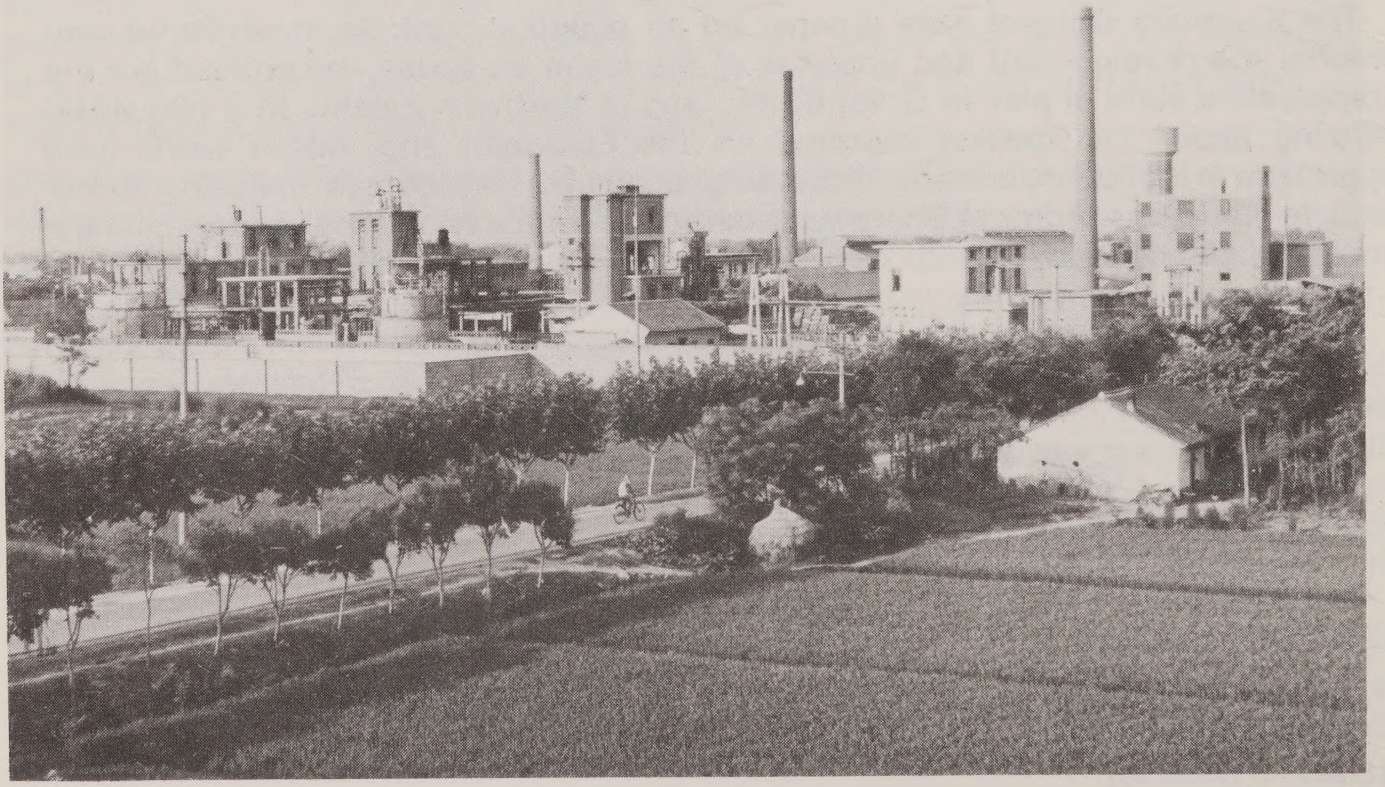
TREES THAT HELP TO REDUCE POLLUTION

by Li Wei,
China Features

Trees that can absorb harmful gases and particles have been planted around many factories in China in recent years. They help purify the air and reduce environmental pollution.

The Kwangchow Chemical Works in south China used to cause environmental pollution with waste chlorine. In order to prevent this, 17,000 trees and shrubs of dozens of species that had been found to be resistant to chlorine were planted around the factory several years ago. The plants grew normally in the chlorine-polluted air, some attaining a height of between 45 and 72 centimetres in six months. A test made in November 1977 showed that every cubic metre of air around the factory contained 0.6 milligrams of chloric dust, 20 per cent lower than in 1975 before the trees were planted. A great number of trees have also been grown near the Kwangchow Nitrogen Fertilizer Plant, the Kwangchow Chemical Fibre Factory and many other factories in the city.

Though taking a fairly long time to produce a measurable effect, the trees are easy to plant and manage. At present, a number of trees and shrubs selected by the botanical



The electrochemical plant in Wushih county, east China, while dealing with the sources of pollution properly, has grown air-purifying trees around itself. It has now been cited as an outstanding unit of the country in pollution control and environmental protection.

research institutes in different parts of China including Liaoning, Yunnan, Chekiang and Kiangsu provinces and Peking are also growing in and around factories.

The ability of trees to absorb harmful gases and particles varies according to the kind of tree, the region, and the growing conditions. In the warm provinces of south China, the trees that absorb chlorine best include alpine fig, beef wood, oleander, mango. The trees that absorb sulphur dioxide include rose apple, almond, mulberry and many other species. Fan palm, *ficus elastica* and a number of other trees are known to be able to absorb hydrogen fluoride.

In northern China provinces that lie at between 40 and 45 degrees north latitude, the winter lasts four to six months with the temperature hovering between 20 and 30 degrees Centrigrade below zero. Here, more than 100 species of deciduous trees capable of absorbing chlorine, sulphur dioxide or hydrogen fluoride have been selected. They include locust, honey locust, persimmon, Chinese elm, ailanthus, eastern plane, paulownia and shrubby althaea. Many evergreens including white-bark pine, armand pine, Chinese arbor-vitae and spruce are also planted for this purpose.

When the trees absorb the harmful gases, they gradually turn them into a harmless metabolite through photosynthesis. Their luxuriant leaves and branches serve to keep the harmful particles in the air from spreading.

In 1973, the Kwangtung Provincial Botanical Research Institute and other institutions in the sub-tropical parts of China singled out upwards of 50 species of air-purifying trees and other plants, on the basis of their monitoring of the trees at some 40 factories and of nearby farm crops and fruit trees. The scientists experimented, fumigating some plants with chlorine, sulphur dioxide or hydrogen fluoride indoors. Others were grown in the polluted areas in pots or in the ground. Yet another group were planted in a pollution-free area. By monitoring the growth of the plants, data was gathered on the relative effectiveness of the various plants in reducing pollution.

Some plants which can indicate the presence of pollutants in the atmosphere were also selected. These plants are highly sensitive and are affected by even very small amounts of harmful gas. Kapok can indicate the presence of chlorine; sunflower, barley and buck-wheat, the presence of sulphur dioxide; cotton, plum and peach, the presence of hydrogen fluoride.

Purifying air with plants is an auxiliary measure for environmental protection in China. The basic method is a comprehensive approach involving improved technology, multi-purpose utilisation in production and proper disposal of industrial wastes. The State Planning Commission recently ordered 167 industrial enterprises which had caused serious environmental pollution to take steps to get it under control by 1982, or they would face suspension of production. The Commission provides that the design, construction and commissioning of all projects, be they new, or extensions or reconstructions, must include anti-pollution installations.

INTERNATIONAL SULPHUR CONTROL CONFERENCE

The North Western Branch of the Institution of Chemical Engineers, in association with the University of Salford, are holding the 3rd International Conference on the Control of Sulphur and Other Gaseous Emissions at the University of Salford, 24-26 April 1979. Subjects to be discussed are: Removal of Sulphur Dioxide; Removal of Hydrogen Sulphide; Control of the Emission of Oxides of Nitrogen; Fume, Acid Gas and Halogen Emission Control. Papers will be presented by representatives of various companies, including ICI, Niro Atomiser, De Jong/Van Den Berg and Ralph M. Parsons.

Further information from: Dr. R. Hughes, Chemical Engineering Department, University of Salford M5 4WT. Tel: 061-736 5843 ext. 449.

Estimates of Smoke and Sulphur Dioxide Pollution From Fuel Combustion in the United Kingdom for the Years 1976 and 1977

by

M-L Weatherley,
Warren Spring Laboratory, Stevenage, Herts.

The estimates are based on fuel consumption statistics published by the Department of Energy. They update the estimates for 1975 and provisional estimates for 1976 published in *Clean Air,* Volume 7, No. 27, Winter 1977, and those for years up to 1974 prepared by Dr. Albert Parker, CBE, in previous issues of *Clean Air.*

Appendix A explains how the fuel consumption data used in the pollution estimates were derived from the published statistics.

Estimates of Pollution by Smoke from Coal Combustion

The fuel consumers who have contributed most significantly over the years to overall emission of smoke in the UK are the coal consumers other than the fuel conversion industries. Coal consumption by the latter (power stations, smokeless fuel production plant, etc) is relatively smokeless, as is combustion of petroleum fuels such as fuel oil, and of solid smokeless fuels. The national or overall contribution of smoke from vehicles is also relatively small, though it can have significant local effects. However, it should be noted that as coal consumption outside power stations decreases, and with it the emission of carbonaceous smoke from inefficient coal combustion, the proportion of smoke from other sources, especially motor vehicles, becomes progressively larger and is already significant in areas where little or no coal is used for domestic heating.

Table 1 shows the estimated emission of smoke from coal combustion by domestic and other consumers in 1976 and 1977, and the corresponding coal consumption. The accompanying graph **(Fig. 1)** shows the trend in emission of smoke from these sources since 1950.

Table 1 Estimates of Pollution by Smoke from Coal Combustion

	1976		1977	
Class of Consumer	*Coal consumption*	*Smoke emission*	*Coal consumption*	*Smoke emission*
Domestic (1)	9.6	0.33	9.7	0.34
Industry and miscellaneous (2)	12.1	0.04	12.1	0.04
Railway (3)	0.1	0.00	0.1	0.00
Total		0.37		0.38

1 Smoke is taken as 3.5 per cent of the weight of coal burnt in domestic open fires, see Brown, R. L. Hawksley, P. G. W. and Horspool, J.M. (J.Inst.Publ.Hlth Engrs, 1959, **58** 208).

[2] For years up to and including 1956, smoke is taken as 1.2 per cent of the weight of coal burnt, as in the Report of the Committee on Air Pollution, Cmd. 9322, London, HMSO, 1954. For 1962 it is taken as 0.5 per cent, for 1971 and subsequent years 0.3 per cent, with intermediate proportionate values for the intervening years.

[3] No longer a significant smoke emitter. The estimate of 2.0 per cent made in Cmd. 9322 is used.

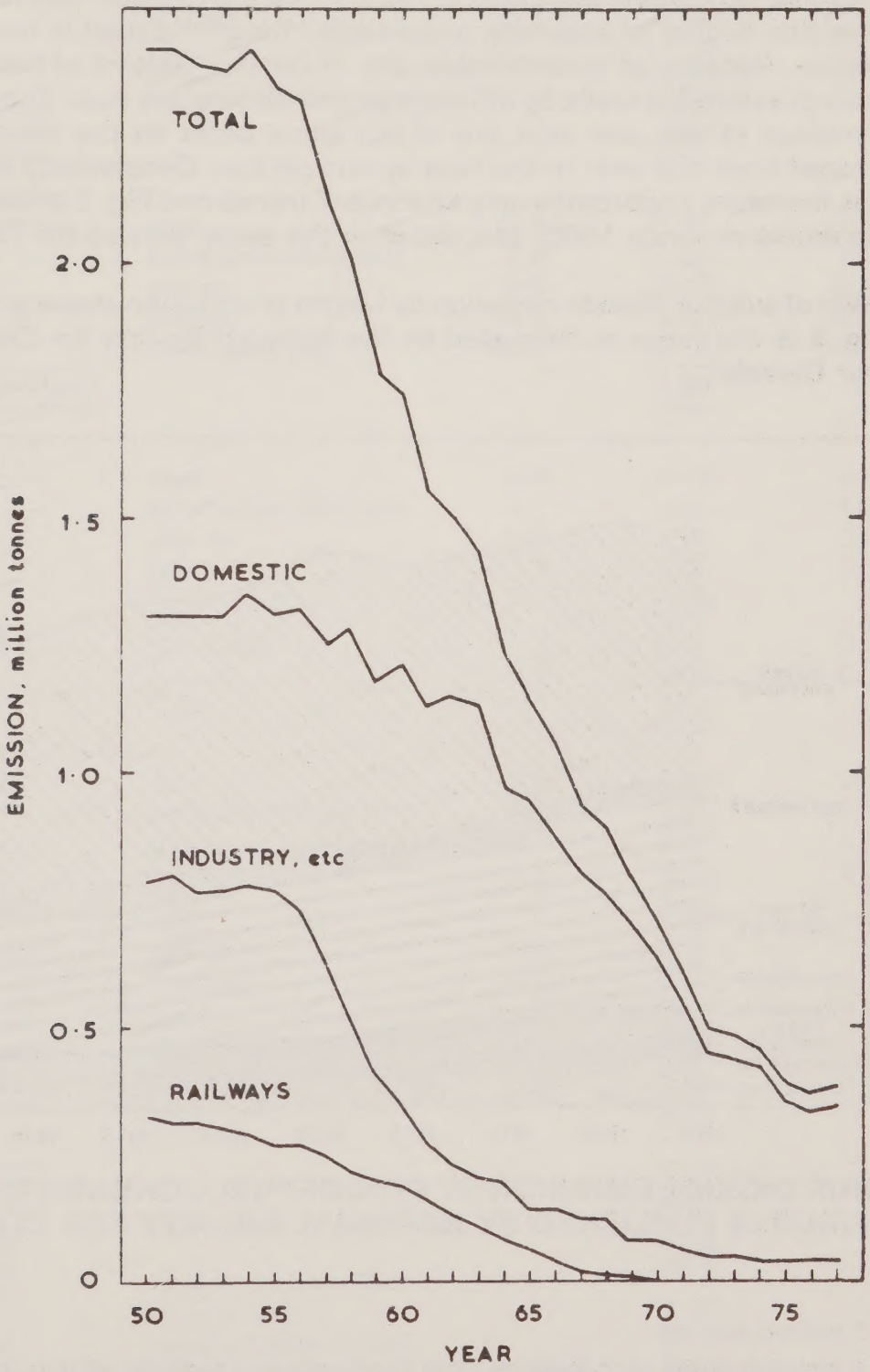


FIG. 1 EMISSION OF SMOKE FROM COAL COMBUSTION IN THE UNITED KINGDOM 1950-1977

Estimates of Pollution by Sulphur Dioxide from Fuel Combustion

Table 2 shows the estimated emission of sulphur dioxide from fuel combustion for the years 1976 and 1977. The sulphur contents used in conjunction with fuel consumption data for estimating emissions were provided by the fuel supply industries and are given in **Appendix B**. The estimates do not include the annual emission from chemical and other processes which probably amounted to a few per cent of the total annual emission from fuel burning.

The sulphur dioxide emissions are given to the nearest 0.01 million tonnes, but do not necessarily have this degree of accuracy; in particular the grand total is not accurate to two decimal places. Because of uncertainties, e.g. in sulphur content of fuels, there are small differences in estimates made by different people for any one year. These between-estimator differences in any one year are of the same order as the changes in total emission estimated from one year to the next by one person. Consistency in estimation over the years is therefore important in any analysis of trends and **Fig. 2** shows estimated sulphur dioxide emission since 1969, calculated in the same way as for Table 2.

The breakdown of sulphur dioxide emission by height of emission above ground level in Table 2 and Fig. 2 is the same as that used by the National Society for Clean Air in its booklet 'Sulphur Dioxide'.

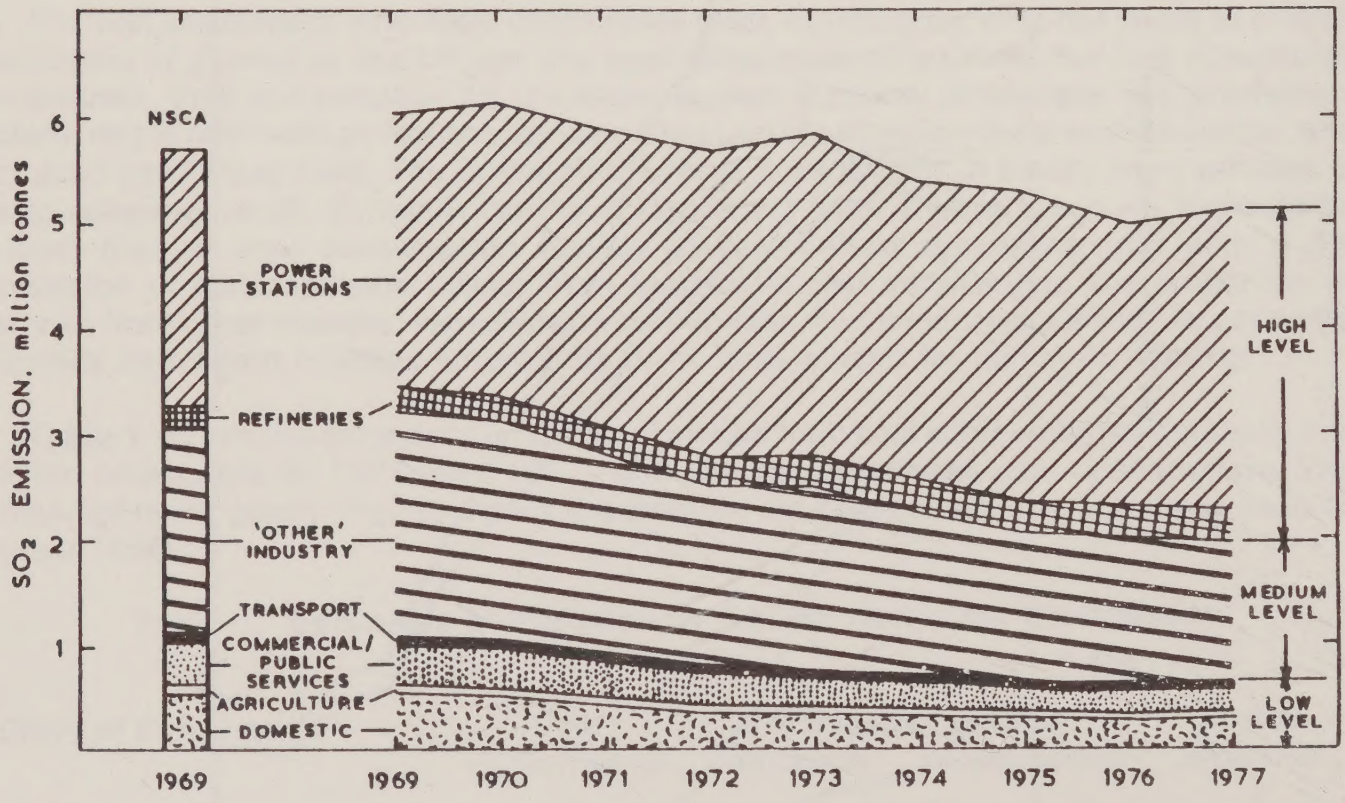


FIG. 2 SULPHUR DIOXIDE EMISSION BY TYPE OF FUEL CONSUMER, 1969-1977 (NSCA = FIGURES PUBLISHED BY NATIONAL SOCIETY FOR CLEAN AIR)

* million therms

† includes small contributions from combustion of burning oil (kerosene) and other fuels which produce less than 0.01 million tonnes of SO2 per individual class of consumer.

Table 2 Estimates of Sulphur Dioxide Emission from Fuel Combustion in the United Kingdom, in 1976 and 1977 (million tonnes unless otherwise specified)

Class of Consumer	*Fuel Type*	1976 *fuel consumption*	1976 *SO2 emission*	1977 *fuel consumption*	1977 *SO2 emission*
High level					
Power stations	coal	77.8	2.10	80.0	2.30
	gas oil	0.4	0.00	0.7	0.01
	fuel oil	10.1	0.58	10.2	0.58
	total		2.69		2.89
Refineries	fuel oil/gas	6.3	0.28	6.2	0.27
Total high level			2.97		3.16
Medium level					
Other industry	coal	13.6	0.25	13.3	0.25
	solid smokeless fuel	2.6	0.05	2.5	0.04
	gas oil	4.9	0.07	5.1	0.06
	fuel oil	15.3	0.90	15.1	0.87
	coke oven gas	996*	0.13	903*	0.12
Total medium level			1.39		1.34
Low level					
Domestic	coal	9.6	0.19	9.7	0.19
	solid smokeless fuel	4.7	0.08	4.7	0.08
	gas oil	0.8	0.01	0.8	0.01
	fuel oil	0.1	0.00	0.1	0.00
	total		0.28		0.29
Agriculture	gas/diesel oil	1.0	0.01	0.8	0.01
	fuel oil	0.3	0.02	0.3	0.02
	total		0.03		0.03
Commercial/public services	coal	2.0	0.04	2.0	0.04
	solid smokeless fuel	0.6	0.01	0.6	0.01
	gas oil	4.0	0.05	4.3	0.05
	fuel oil	2.2	0.13	2.3	0.13
	total		0.24		0.24
Rail transport	gas oil	0.8	0.01	0.8	0.01
	fuel oil	0.0	0.00	0.1	0.00
	total		0.02		0.01
Road transport	motor spirit	16.9	0.02	17.3	0.02
	diesel fuel	5.6	0.04	5.7	0.04
	total		0.05		0.05
Total low level			0.62		0.62
Grand total†			4.98		5.12
total	coal (including coke oven gas)		2.72		2.91
total	solid smokeless fuel		0.13		0.13
total	petroleum		2.13		2.08
Grand total†			4.98		5.12

APPENDIX A

Sources of Fuel Consumption Data used in Smoke and Sulphur Dioxide Emission Estimations for Years up to 1977 inclusive

Sources are given for the year 1977, tables quoted being those in *'Digest of United Kingdom Energy Statistics 1978' Department of Energy (London: HMSO, 1978).* Earlier data were obtained in the same way from previous editions of the *Digest.*

	Table No.	
Coal		
Domestic – house coal*(a)*	19	Direct final consumption by sectors: House coal.
– miners' coal	19	Direct final consumption by sectors: Miners' coal.
Collieries	19	Consumed by collieries.
Industry (other than fuel producers)	19	Direct final consumption by sectors: Total industry.
Public services*(b)*	19	Direct final consumption by sectors: Public administration.
Miscellaneous*(c)*	19	Direct final consumption by sectors: Miscellaneous.
Railways*(d)*	19	Direct final consumption by sectors: Railways.
Agriculture*(d)*	19	Direct final consumption by sectors: Agriculture.
Power stations	19	Input to secondary fuel producers: Electricity supply industry: Total.
Gas works, low temperature carbonisation, patent fuel plants	19	Input to secondary fuel producers: Gas supply industry, Low temperature carbonisation plants, Patent fuel plants.
Coke oven gas		
Coke ovens	58	Coke oven gas: Total.
Solid smokeless fuels		
Domestic*(e)*	34	Up till 1972 inclusive, Grand total; from 1973, Grand total, deduct Public administration: Coke and breeze (Table 15).
Public services*(f)*	15	Public administration: Coke and breeze.
Miscellaneous*(g)*	15	Miscellaneous: Coke and breeze, Other solid fuel.
Industry	15	Iron and steel: Coke and breeze, Other purposes (i.e. 'other' than 'Blast furnaces'); add Other industries: Coke and breeze, Other solid fuel.
Railways*(d)*	15	Transport: Rail: Coke and breeze.
Agriculture*(d)*	15	Agriculture: Coke and breeze.

	Table No.	
Petroleum		
Motor spirit	54	All classes of final consumer: Motor spirit.
Diesel fuel	54	All classes of final consumer: Derv fuel.
Burning oil*(d)*		
domestic – premium	54	Domestic: Burning oil: Premier.
– standard	54	Domestic: Burning oil: Standard.
agriculture	54	Agriculture: Burning oil.
public services	54	Public administration: Burning oil.
industry	54	Other industries: Burning oil.
railways	54	Transport: Railways: Burning oil.
Vaporising oil*(d)*		
agriculture	54	Agriculture: Vaporising oil.
Gas oil		
power stations	55	Public utilities: Electricity generation: Gas/diesel oil.
central heating		
private houses/other dwellings	55	Central heating – Non-industrial: Private houses, other dwellings: Gas/diesel oil.
other non-industrial	55	Total central heating: Gas/diesel oil; deduct private houses, Other dwellings: Gas/diesel oil.
industry (other than power stations, refineries)	54	All classes of final consumer: Gas/diesel oil; deduct Marine: Total: Gas/diesel oil (Table 55); deduct Total central heating (non-industrial): Gas/diesel oil (Table 55); deduct Agriculture and forestry: Total: Gas/diesel oil (Table 55); deduct Railways: Gas/diesel oil (Table 55).
Gas oil (contd.)		
agriculture	55	Agriculture and forestry: Total: Gas/diesel oil.
railways	55	Railways: Gas/diesel oil.
Fuel oil		
power stations	55	Public utilities: Electricity generation: Fuel oil.
central heating		
private houses/other dwellings*(d)*	55	Central heating – Non-industrial: Private houses, other dwellings: Fuel oil
other non-industrial	55	Total central heating: Fuel oil; deduct Central heating: Private houses, Other dwellings: fuel oil.
industry (other than power stations, refineries)	54	All classes of final consumer: Fuel oil; deduct Marine: Total: Fuel oil (Table 55); deduct Total central heating: Fuel oil (Table 55); deduct Agriculture and

	Table No.	
		forestry: Total: Fuel oil (Table 55); deduct Railways: Fuel oil (Table 55).
agriculture	55	Agriculture and forestry: Total: Fuel oil.
railways*(d)*	55	Railways: Fuel oil.
Refinery fuel	54	Consumption by fuel producers: Refineries.

Notes

Some of the solid fuel statistics for 1973 onwards (e.g. for coal, coke) refer to disposals by fuel producers, whereas those for previous years are for disposals by merchants.

(a) mainly domestic, but also commercial and smaller industrial consumers;
(b) colliery disposals to national and local authorities;
(c) includes disposals from collieries to commercial and non-industrial establishments as well as shipments to the Channel Islands and distribution losses; included with commercial/public services in Table 2;
(d) contribution to SO2 emission very small (< 0.005 million tonnes);
(e) owing to changes in the form of the energy statistics the tables used are not the same as those used in previous WSL estimations (published before 1977) and give slightly different figures from the earlier estimates;
(f) estimates of consumption by national and local authority services;
(g) included with commercial/public services in Table 2.

APPENDIX B

Sulphur Contents of Fuels

Coal

Domestic	1.3 per cent up to 1971 inclusive, 1.25 per cent from 1972 to 1977; 20 per cent of the sulphur retained in the ash.
Power stations	1.53 per cent up to 1972, 1.5 per cent in 1973 and 1974, 1.6 per cent in 1975, 1.5 per cent in 1976; 1.6 per cent in 1977; 10 per cent retained in the ash; allowance made for gas washing at Battersea.
Gas works, etc.	SO2 emission taken as 0.72 per cent of the weight of coal used.
Other users	1.4 per cent up to 1971 inclusive; 1.35 per cent from 1972 to 1974, 1.23 per cent from 1975 to 1977; 10 per cent retained in the ash.
Coke ovens	As unpurified coke oven gas is used by industry, emissions must include these sources as well as the SO2 emitted by burning the gas to heat the coke ovens themselves. The item 'coke oven gas, total' is used and emissions calculated on the assumption that a million therms of gas contain 65 t sulphur. This then does not include coke oven gas used by gas undertakings and therefore purified.

Solid smokeless fuels

Domestic	1.0 per cent; 20 per cent retained in the ash.
Other users	1.0 per cent; 10 per cent retained in the ash.

Petroleum

Motor spirit	0.05 per cent from 1965 to 1973, 0.04 per cent in 1974 and 1975, and 0.05 per cent in 1976 and 1977.
Diesel fuel	0.3 per cent from 1965 to 1971, 0.37 per cent in 1972, 0.3 per cent in 1973, 0.37 per cent in 1974, 0.35 per cent in 1975, and 0.32 per cent in 1976 and 1977.
Burning oil (usually negligible)	Premium 0.05 per cent from 1965 to 1970, 0.06 per cent in 1971, 0.03 per cent from 1972 to 1977; regular 0.10 per cent from 1965 to 1970, 0.08 per cent in 1971, 0.06 per cent in 1972, 0.07 per cent in 1973, 0.05 per cent in 1974, 0.07 per cent in 1975, and 0.05 per cent in 1976 and 1977.
Gas oil	0.8 per cent in 1965, 0.7 per cent from 1970 until 1973, 0.69 per cent in 1974, 0.7 per cent in 1975, 0.67 per cent in 1976, 0.56 per cent in 1977; regular decrease assumed between 1965 and 1970.
Fuel oil, power stations	2.8 per cent in 1969, thereafter 2.7, 2.8, 2.95 per cent from 1972 to 1974, and 3.13 per cent in 1975, 2.92 per cent in 1976, 2.85 per cent in 1977; allowance for gas washing at Bankside.
other users	3.1 per cent in 1965, 2.72 per cent from 1970 to 1972, 2.75 per cent in 1973, 2.85 per cent in 1974, 2.93 per cent in 1975 and 1976, 2.9 per cent in 1977; regular decrease assumed between 1965 and 1970.
Refinery fuel	Refinery fuel is a mixture of low-sulphur gas and high-sulphur oil; ¾ of the total consumption is used in estimating sulphur dioxide emission, and sulphur content as for fuel oil, other users, above.

Notes

The sulphur contents of the various fuels in the 1950s were taken from Report of the Committee on Air Pollution, Cmd 9322, London, HMSO, 1954. These were modified for subsequent years in the light of information supplied by the fuel industries, (in particular by the National Coal Board, the Central Electricity Generating Board, and the oil industry, including the Institute of Petroleum), and by the Energy Technology Division of the former Department of Trade and Industry. The Institute of Petroleum publishes the sulphur contents of petroleum fuels, contents for 1977 being given in Petroleum Review, April 1978.

Retrospective analyses of sulphur contents by the fuel industries sometimes involve amendments of the sulphur contents previously supplied for certain years and hence amendments in published estimates of SO2 emission.

For sulphur contents of petroleum fuels in earlier years than those quoted, see Warren Spring Laboratory Report LR 214(AP) (years 1950 onwards).

Smokeless Newcastle Now Curbs Noise

by
Colin Cresswell

The smoke control programme in Newcastle upon Tyne came to an end on 1st October 1978 when the last of 66 Smoke Control Orders became operative. The programme commenced in 1958 when average daily smoke and sulphur dioxide concentrations were 234 ug/m^3 and 204 ug/m^3 respectively and the fact that the average concentrations monitored for 1977 were reduced to 36 ug/m^3 and 86 ug/m^3 again respectively, gives some guide as to what has been achieved.

Smokeless area north of Newcastle's Civic Centre, taken from roof-top level on the 27th November 1978.

Although it is now rare to observe smoke being emitted from a chimney in the City, work still proceeds on dealing with industrial sources of air pollution and monitoring for a variety of pollutants, while enforcement of domestic smoke control continues unabated. A continuous positive policy of bringing home to coal merchants what control means to them has been followed. Apart from the usual circular letters informing them which areas were becoming controlled, etc., 20 merchants were on 90 occasions warned in writing that it has been alleged they had been delivering coal in smoke control areas. Eventually it was found necessary to institute proceedings against four merchants

in respect of offences under the provisions of Section 9, Clean Air Act 1968. All were found guilty, the fines ranging from £5 to £20 plus costs, but more important, the offenders were interviewed by the Northern Regional Panel of the Approved Coal Merchants Scheme. This latter body left the people concerned in no doubt how seriously they considered the offences to be and as a result of this and our own efforts, we enjoy the maximum co-operation from the solid fuel distributive trade.

It must not be assumed, however, that all our activities have been directed at the merchants. Countless occupiers of dwellings where smoke has been noted coming from the chimney have been interviewed, damaged fireplaces repaired, advice given, warnings issued, etc. Unfortunately even three written warnings are insufficient for some people and it has been necessary, therefore, to institute proceedings against 10 occupiers. All but one, where the case is still pending, have been found guilty and in the last four cases the Court increased the fines to £20 plus costs, some measure of how seriously the Magistrates viewed the offences.

There remains, of course, that constant source of irritation, the corner shop selling small bags of prepacked coal. Situated miles away from any uncontrolled area and well away from any through highway used by motorists, these shops enjoy a thriving business as much to the annoyance of local coal merchants as to the Environmental Health Department. All possible is being done to eliminate or control this trade through the Society, the SSFF, the NCB, the ACMS, Consumer Protection Officers and the Domestic Coal Consumers Council. Although an amendment to legislation which would simply prohibit the sale of bituminous coal in smoke control areas is the long term objective, it may just be possible to do something positive in the short term through the Solid Fuel Packers Scheme.

It was understandable that once the back of the smoke pollution problem was broken, the Health and Environment Committee should consider the possibility of improving the noise environment of the City by the introduction of Noise Abatement Zones. After studying a report on the relevant provisions of the Control of Pollution Act 1974, the staffing implications and the potential benefits, it was decided in April 1976 to make No. 1 Noise Abatement Zone.

This first Order covered 1,756 acres within which 28 properties were identified under four main headings, viz., industrial premises, commercial premises, public utility installations and places of public entertainment and assembly. The advice given in Circular 2/76 was followed as far as practicable, the main reasons for the area chosen being that it contained four relatively large factories adjoining one another with a long history of noise problems which it had proved impossible to solve using nuisance procedure and land that was being developed as an industrial trading estate. A further area including 75 identified properties in 1,275 acres was declared to be the second zone 13 months later.

Prior to the submission of the Orders to the Department of the Environment for confirmation, every effort was made to explain thoroughly to all owners and occupiers of identified properties the reasons for the Orders and the ways in which they could be affected. As a result of these efforts only one objection was lodged with the Ministry and this was quickly withdrawn once the company concerned appointed a Noise Consultant.

During this time the local residents were constantly reminded that the introduction of zones would only guarantee that there was no increase in noise from industrial and commercial premises and we were, therefore, able to avoid a situation where there was widespread public anticipation of wholesale noticeable noise reductions.

The problems encountered and the techniques used have been described at length elsewhere and it is as yet too early to predict confidently the success or otherwise of noise abatement zones in the City of Newcastle. Complaints or the lack of them are not an infallible guide to the value of any attempt to improve the environment, but prior to monitoring around the four factories which are the core of our No. 1 Zone we averaged 80 to 100 complaints a year. During the past 12 months there have been none.

ACOUSTIC TESTING AND RATING FOR HEATING AND VENTILATING EQUIPMENT

Measurement of the sound power emission from a machine or similar item is of considerable importance, especially in the heating and ventilating industry. Two new British Standards have been adopted in connection with acoustic performance of air distribution equipment and systems.

BS 4857 **Methods for testing and rating terminal reheat units for air distribution systems** Part 2 **Acoustic testing and rating** is concerned with static terminal attenuation, sound generation (upstream and downstream of the unit) and radiation of sound from the casing. Terminal attuenuation is the difference between the sound power levels in the supply inlet and outlet ducts. The standard gives details regarding instrumentation, test procedure and calculations. Part 1 of the standard deals with thermal and aerodynamic performance.

The other new standard is BS 4954 **Methods for testing and rating induction units for air distribution systems** Part 2 **Acoustic testing and rating.** An induction unit is an assembly in which the treated primary air which has been received under pressure from a central plant is discharged at high velocity through a series of nozzles fitted within the induction unit itself. This high velocity discharge causes an induction process inside the unit and thus an inflow of secondary air from the treated space into the unit. The acoustic testing procedure, therefore, is based upon a method of measuring the sound power emission caused when air is passed through the induction unit. In addition the measurements enable the terminal attenuation (difference in sound power level between the supply duct and the unit) to be determined.

Test methods described in BS 4954 Part 2 show how, with an appropriate noise source and duct, the acoustic measurements may be made in a test room, when the unit is fitted to the end of the duct. Details of instrumentation and typical calculations are given.

Copies of BS 4857 Part 2, price £5.60, and BS 4954 Part 2, price £4.20, may be obtained from BSI Sales Department, 101 Pentonville Road, London N1 9ND.

WHAT CAN BE DONE ABOUT GARDEN BONFIRES?

The Society's leaflet on *Smoke from Garden Bonfires* has been widely distributed throughout the country since it appeared two years ago. The leaflet recommends best practice for minimising smoke from burning garden waste, and briefly states the law relating to smoke emission, as follows:

'Under Section 16 of the Clean Air Act 1956, a smoky bonfire could be actionable. If your local authority is satisfied that a nuisance has occurred, and even though it has temporarily ceased, it is likely to recur, the authority may apply to the Magistrate's Court for a Nuisance Order.

The leaflet was intended to stimulate public awareness of the potential nuisance from garden bonfires, and to warn those people who made a habit of lighting smoky bonfires that action could be taken against them in the Courts.

However, some Member local authorities have asked the Society to find out whether anything more can be done by the local authority to deal with the problem of bonfire smoke under good rule and Government by-laws. The Department of the Environment and the Home Office were contacted, and the following joint statement was issued.

Joint statement by the Home Office and the Department of the Environment on existing powers to deal with the nuisance caused by smoke from garden bonfires.

A number of district and borough councils have enquired in the past about the possibility of making good rule and government byelaws to deal with the problems caused by smoke from garden bonfires under section 235 of the Local Government Act 1972. The Home Office has always taken the view, however, that such byelaws cannot be made within the scope of that section as any annoyance caused by the smoke is in the nature of a private, rather than a public nuisance. We know of no other general legislation under which byelaws relating to the burning of domestic bonfires may be made but we understand that the Borough of Torbay obtained powers under section 56 of the Torbay Corporation Act 1971 to make byelaws prescribing the times and days of the week during which trade refuse might be set fire to or burnt in yards or gardens. It is possible that some other local authorities have obtained similar powers by means of local Acts but it is not known how many authorities have such powers or have elected to use them.

Although the lighting of bonfires is not prohibited, it is incumbent upon anyone doing so to avoid causing a nuisance. Under Part III of the Public Health Act 1936, as extended by section 16 of the Clean Air Act 1956, local authorities have powers, enforceable in the magistrates courts, to require the abatement of smoke emissions which amount to a statutory nuisance and to prevent recurrence. In addition, an individual may complain about nuisance direct to the magistrates, who may similarly order abatement and prohibit recurrence.

We do not think that it would be practicable to ban the lighting of bonfires and it is very doubtful whether legislation to restrict bonfires to certain times or certain days would be helpful. Indeed, since all bonfires would then need to be lit at the same times, the nuisance could well be greater.

CHIMNEYS SET TO MAKE A COMEBACK
NCB Chairman Urges Fullest Household Fuel Options

While only one new house in six was being built with a chimney there are distinct signs of this neglected feature making a welcome comeback, Sir Derek Ezra, Chairman of the National Coal Board, said at the annual general meeting of the National Fireplace Council in London.

A recent survey by the Domestic Coal Consumers' Council (covering half the 485 local authorities in Great Britain, 35 of the larger housing associations and 15 per cent of current private housebuilding) revealed a significant move among smaller housing authorities towards reinstating the chimney.

'As the continuance of the chimney as a housing feature is the lifeline of solid fuel use in the home, I hope that larger authorities will take note and, in their turn, will increasingly give people the flexibility of heating options that the chimney provides,' Sir Derek said.

The highest proportion of new houses incorporating chimneys – 27 per cent – were in local authority areas with populations under 100,000. Of the larger housing authorities surveyed only four – Wolverhampton, Wakefield, Doncaster and Sefton (Liverpool) – were building more than 75 per cent of houses with chimneys.

The overall proportion of 16 per cent of houses under construction having a chimney shows an increase on the figures for the previous year, and there are other indications of a return to the chimney.

The Scottish Special Housing Authority had reversed its previous policy of no chimneys to providing chimneys for all except 3 per cent of its 2,200 new houses in 1977/78. The Development Board for Rural Wales and the Northampton Development Corporation are also building a high proportion of with-chimney houses.

Manufacturers also reported 10-15 per cent increases in sales of prefabricated chimneys, some of which would go into existing houses under modernisation schemes, which was a pointer to an encouraging trend.

The industry's Solid Fuel Advisory Service campaign to get people to open up their blocked-up fireplaces and restore an open fire was reflected by continuing improved sales of approved appliances.

These showed a 13 per cent increase in the last seven months, indicating a total market for more than 300,000 units in the full year. And there was an increasing and now quite substantial call for open-fire types such as fire baskets and dog grates.

'We know, however, that there remain 4 million homes with a blocked-off fireplace, so the potential is enormous for us to convince people of the simplest way to restoring the attractions of a real fire,' Sir Derek said.

He called for all-out action by the solid fuel interests to tackle the chimney problem in two directions:

— in securing a market increase in the proportion of with-chimney houses being built;

— providing convenient heating packages – including a factory-made chimney – for the 3 million existing houses in the country shut off from the solid fuel option by policies of omitting a chimney in the past.

LETTER TO THE EDITOR

Dear Sir,

In your editorial for the Winter 1978 issue of *Clean Air,* you state quite categorically that 'at present there is no medical evidence to show that the lead in air emitted from road vehicles is a danger to health'.

I have a 500 page report from the American government dated December 1977, in which 92 scientists review critically over 1000 research papers about airborne lead from motor vehicles, including papers from scientists in this country, and the firm conclusion is that airborne lead from motor vehicles does represent a danger to health, particularly for occupationally-exposed groups, pregnant women and pre-school children. ('Air Quality Criteria for Lead' and other papers, from the United States Environmental Protection Agency, Technical Information Center, Library Services Office MD35, Research Triangle Park, NC27711, USA).

Likewise I have correspondence from the West German government which states that as long ago as 1971 'the basis for the West German government's decision to enact legislation for the lowering of the lead content (of petrol) to a level of 0.15g/l (three times lower than the British level) was the realisation that the concentration of lead compounds in automobile exhaust gases constitutes a health hazard for the population. Lead and its compounds have long been recognised everywhere as one of the most toxic elements in existence. The lead emissions of exhaust gases are particularly dangerous in this respect since they occur in the form of minute particles which reach the pulmonary tract in respired air.'

And in case you require documentation published in Britain, I would refer you to the report 'The Health Effects of Lead on Children', which reviews over 50 medical research papers published since 1976, and which concludes: 'Body lead levels in the range now regarded as "normal" are significantly associated with pathogenic effects on mental function in children. Inhalation of lead-contaminated air . . .contributes significantly to body lead burdens . . . Most airborne lead originates from organolead petrol additives, although industrial emissions may also be important in some localities.' (report published by the Conservation Society, 1978 – 12a Guildford Street, Chertsey, Surrey, £1.)

To have come across an editorial similar to yours in an oil industry publication would not have surprised me, but in supposedly-independent *Clean Air* journal, it came as something of a shock, and I hope you will publish this letter to balance the record somewhat.

Yours faithfully,
Nicholas Albery

107 Freston Road, W11

REDUCTION IN THE PERMITTED LEAD CONTENT OF PETROL

New Regulations concerning lead in petrol have been laid before Parliament.

The new Regulations amend the Motor Fuel (Lead Content of Petrol) Regulations 1976 which prescribe the maximum permissible lead content of petrol (in grammes per litre) and require petrol pumps in retail garages to be marked with star markings which are

specified in the British Standard for petrol for motor vehicles. The star markings indicate the octane rating of petrol (which is influenced by the lead level) and, by reference to the British Standard, the maximum lead content. The amendments provide that:

(1) the maximum level of lead in petrol will be reduced from 0.45 to 0.40 grammes per litre from 1st January 1981,
(2) the test method for land will be that in BS 5657: 1978 ISO 3830: 1977 in place of BS 2878: 1968, and
(3) the Regulations refer to the revised version of the British Standard specification for petrol for motor vehicles (BS 4040).

NOISE AROUND AIRPORTS

Noise Advisory Council Urges Government Action

The Noise Advisory Council have been considering the Government's White Paper on Airports Policy, published earlier this year. They welcome the steps announced in the White Paper which the Government are taking to reduce the impact of aircraft noise nuisance and to seek international agreement on their stringent noise standards for aircraft. However, the Council offered further advice and recommendations for consideration in the Government's development of these and other policies:

1. Any expansion of provincial airports should be without detriment to the environment and long-term aspects of transfer of traffic from the South-East needs to be monitored.

2. They urged the Government to investigate further the concept of noise ceilings limiting the total dose of noise received by areas surrounding major airports.

3. The Council recommended that current and future noise levels should be considered in any development plans. At regional airports developments should not be permitted within the 40 NNI contour.

4. They stressed the need for careful study of the environmental impact, purpose, and economic reliability of any increased provision for helicopter traffic in London.

The Noise Advisory Council will be represented on the Advisory Committee on Airports Policy, which will have the task of formulating advice on a longer-term airport option.

NUCLEAR INCIDENTS

Quarterly Statement of Incidents at Nuclear Installations, Third Quarter 1978

The Health and Safety Executive have presented a statement on Nuclear incidents for the period 1st July to 30th September 1978.

The most frequently occurring type of incident involved small spillages or leakages of radiation activity and cases or potential cases of radiation exposure of workers exceeding the permissible levels recommended by the International Commission on Radiological Protection. In a number of these cases investigations into the circumstances of the incidents are still continuing. Two small fires occurred in which radioactive materials were involved. None of the incidents caused a significant radiological hazard to people on the Nuclear site, or to members of the public.

For those interested in seeing the full statement, listing the incidents in chronological order together with the name of the Nuclear Establishment which they refer, contact the NSCA Library at Brighton, Tel. (0273) 26313.

INTERNATIONAL NEWS

FRANCE

The French Institute of Energy has published an extremely useful list of standards of emission and air quality standards, 1978, for the principal industrialised countries.
(Limitation des Emission de Polluants et Qualite de l'Air. Valeurs Reglementaire dans les Principaux Pays Industrialises. Specifications en vigueur en 1978, par Mme P. Jarrault, Ingenieur, Centre de Documentation IFC).
Obtainable from: Institut Francais de l'Energie, 3 Rue Henri-Heine - 75016 Paris; Tel. 647.41.23. Publication No. 63, July 1978, price 159F, post paid.
(Cheques payable to: S.A. Editions Europeennes Thermiques & Industrie (EETI).

HONG KONG

Dr. Stuart Reed, formerly of the UK's Greater London Council, Scientific Branch, and now Environmental Protection Adviser for the Hong Kong Government, has revealed new proposals to protect the environment of Hong Kong. The government is in the final stages of preparing legislation for the control of all forms of pollution, comprising five ordinances controlling air, noise and water pollution, solid waste disposal, and a requirement for environmental impact analysis. Also to be introduced in the legislation will be three aspects new to Hong Kong, covering the composition of fuels, emissions other than smoke and grit, and the control of odours. The new proposals have been drawn up by the Environmental Protection Unit in conjunction with the General Chamber of Commerce, the Chinese Manufacturers Association, and the Federation of Hong Kong Industries. In the long term, the Environmental Protection Unit is looking for improvements through the natural process of urban industrial renewal which will have to comply with the new requirements.

UNITED STATES

Response to a Complaint about Catalytic Converters

The following letter appeared in the 18th November 1978 *Washington Post*. It was written by the Secretary/Treasurer of the Manufacturers of Emission Controls Association in response to a letter complaining about the performance of catalytic converter equipped automobiles:
'The letter in the 11th November *Washington Post* on catalytic converters requires a response to correct some serious misconceptions. The Environmental Protection Agency does not require any car to use catalytic converters. It does set standards that require auto makers to limit poisonous and unhealthy exhaust discharges to a tolerable level. Some makers of small cars can do this without a converter, but many other small car makers here and abroad choose to employ them. They are, indeed, used on nearly all large cars because the standards are not easily met otherwise. Until the catalytic converter was adopted in 1975, gasoline mileage had been steadily deteriorating because the earlier methods of controlling pollution required burning excess fuel. In the 1975 model year, gas mileage went up 13 per cent on an average and 25 per cent on many models. It has been improved every year since then – much of the credit going to the converter, which allowed much better engine tuning. The converter is about five feet from the engine and is essentially unrelated to it. Overheating, poor drivability and excess fuel consumption are in no way related to the converter – which is far

''downstream'' and ''after the fact''. Encouraging people to remove their converters or to use leaded fuel in cars equipped with them is promoting dangerous air pollution and negating the cost and effort that is going into the clean-air program.'

SOUTH AFRICA

International Conference on Air Pollution Pretoria, S. Africa, 22-25 October 1979

A four-day International Conference on Air Pollution sponsored by the Department of Health of the Republic of South Africa (RSA), and jointly arranged with the South African National Association for Clean Air, and the Council for Scientific and Industrial Research, RSA. To be held at the CSIR Conference Centre, Pretoria, Republic of South Africa.

Topics: Legislation (International policy trends); Energy Utilisation; Land-use Planning (Minimising potential problems by proper land utilisation); Economics (Macro and Micro-Economic aspects); Technology (Technological advances); Research (Evaluation of research work on air pollution sources, movement and spread of pollutants, trans-formation to other species, monitoring and environmental effects on impact, regional and global scales; Community Administration (Problems associated with human settlement); Public Reaction (Is progress satisfying public needs?).

Registration fees: R60.00 per delegate (approx. US$70.00) or, R55.00 per delegate for members of the South African National Association for Clean Air. Payment of registration fees entitles delegates to a full set of conference documents, lunches and morning and afternoon refreshments at the conference venue. Delegates will be responsible for their own arrangements concerning travel and accommodation.

Enquiries to: The Conference Secretariat S.193
Conference Division, CSIR,
P.O. Box 395,
PRETORIA,
Republic of South Africa.
Pretoria (012) 74 – 9111 x 3300 (Miss Coetzee).

CANADA

Len Marchand Announces Emission Guidelines for Packaged Incinerators

Guidelines recommending limits on atmospheric emissions from packaged incinerators in Canada were announced by Environment Minister Len Marchand. The guidelines were developed under the federal Clean Air Act.

Packaged incinerators – usually assembled and ready for use – are employed by institutional, commercial, and industrial establishments. They typically have a burning capacity of 100 kilograms of solid wastes per hour, although they vary in size up to 900 kilograms per hour.

As a result of their operation, several air contaminants are emitted – particulate matter, hydrogen chloride and sulphur dioxide. Odour is also a problem under certain conditions. While the total amount of these pollutants is relatively small on a national scale, they can be a significant source of local pollution and nuisance complaints. There are an estimated 10,000 of these incinerators currently operating in Canada.

The guidelines were developed in co-operation with industry and provincial authorities. The intent of the guidelines is that gases discharged to the atmosphere from new installations should not be visible (zero opacity).

In addition, the gases should not contain particulate matter in excess of 0.75 grams per kilogram of solid waste burned. Emissions should not contain hydrogen chloride in excess of 100 parts per million on a dry basis, corrected to 50 per cent excess air, nor sulphur dioxide in excess of 250 ppm on a dry basis, corrected to 50 per cent excess air. Emissions limits for particulate matter and opacity for new installations are based on the use of new technology which allows a reduction of emissions of over 50 per cent as compared to older installations. This result is achieved by the incinerator design itself without the use of add-on devices such as particulate collectors. The emission guidelines also include recommended enforcement procedures adapted to the large number of sources involved.

POLLUTION ABSTRACTS

108 A surface sampler for measuring solids and acid deposition onto the flue-duct walls of oil-fired boilers: the CERL deposition sampler. Dalmon, J., Tidy, D., and Towell, D. E. J. Inst. Fuel, Dec. 1978, pp 202-205.
The cause and control of acid smut emission from oil-fired boiler plant is being extensively investigated by the CEGB. This paper described an apparatus developed at the Central Electricity Research Laboratories for use in these investigations. The device, which has been named the CERL deposition sampler, consists of a temperature-controlled, gold-plated collecting disc mounted flush with the duct surface. Its construction and use is described. Its use in the investigations has produced unique and valuable information about the deposition of acid and solid materials on to the surface of flue gas exhaust ducts.

109 Noise-Induced Hearing Loss and the Law. Grime, R. P. Chemical Engineer, No. 340, Jan. 1979, pp 41-43.
This paper examines three legal aspects of occupational noise. First, the legal control of noise through the Factories Act 1961 and the Health and Safety at Work Act 1974, the setting of standards through documents such as the Code of Practice on Reducing the Exposure of Employed Persons to Noise (1972) and existing and likely Codes of Regulation. Second, civil claims for compensation brought by those injured by exposure to excessive noise, of which there have been many, the criteria of liability and levels of damages awarded. Third and last, the application of the National Insurance (Industrial Injuries) Scheme to industrial deafness.

110 Pollutants from waste-to-energy conversion systems. Environmental Science and Technology, Vol. 12, No. 11, Nov. 1978.
Today, with fewer convenient landfill sites available, and the costs of solid waste management and energy increasing, cities and counties (USA) are again considering combustion systems as an economically attractive option. However, the systems now being considered incorporate energy recovery in addition to volume reduction. The new generation of combustion systems is an improvement over its smoky predecessors. Nevertheless, these new units still produce atmospheric, aquatic, and solid pollutants that must be controlled.

111 Activated Carbon Report. Environmental Science and Technology. Vol. 12, No. 10, Oct. 1978, pp 1138-1149.
The report focuses on the US Water Treatment industry's investigations into the use of activated carbon to remove aqueous organic pollutants. Proposed US organics regulations would require the application of granular activated carbon (GAC) treatment to vulnerable water supplies, and a symposium held in September 1978 attempted to accelerate the co-ordination of the available understanding of GAC treatment. This report summarises the papers presented at the symposium; the present state of the art in business and technology; and the regulations on the United States' horizon.

NEW SMOKE CONTROL ORDERS

The lists below are supplementary to the information in the last issue of **Clean Air (Winter 1978)** which gave the position up to **30th September 1978**. They now show changes and additions up to **31st December 1978.**

Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase.

The list of new areas in operation of smoke control is based on the plans submitted to the Department of Environment, but may erroneously include some local authorities who have made postponements, without notifying the Ministry of the fact.

ENGLAND
NEW SMOKE CONTROL ORDERS IN OPERATION

Northern

Gateshead Low Fell (No. 5); Hartlepool No. 33; Newcastle upon Tyne No. 3 (Castle Ward), No. 10 (Gosforth), No. 24 (Newburn), No. 26, No. 27, No. 28, No. 29.

North West

Bolton No. 9 (Little Lever No. 6) and No. 10 (Bolton No. 52A); Bury No. 4A (Radcliffe), No. 6 (Tottington), No. 8 (Ramsbottom); Ellesmere Port and Neston No. 15; Hyndburn No. 38; Preston No. 37 and No. 38; Rossendale No. 2; St. Helens No. 12; Vale Royal No. 1 (Manchester Road). Note: Blackburn No. 18 came into operation 1.7.78, and was omitted from the list published in *Clean Air,* Winter 1978.

Yorkshire and Humberside

Barnsley No. 16 (Worsbrough) and No. 18 (Wombwell); Doncaster (Mexborough) No. 7, No. 8 and No. 9; Leeds No. 5 (Morley – Middleton Road), No. 6 (Rothwell – Mickletown) and No. 7 (Rothwell – Stourton); Lincoln No. 15; Rotherham (Kimberworth Holmes) and (Thorpe); York No. 6.

West Midlands

Coventry No. 18; Newcastle-under-Lyme (Newcastle No. 10) and (Kidsgrove No. 19); North Warwickshire No. 4; Nuneaton No. 17 (Nuneaton Central).

East Midlands

Amber Valley No. 7 (Ripley West), No. 8 (The Laund, Belper) and No. 9 (Aldercar); Bassetlaw (Worksop No. 6, Manton); Blaby No. 11 (Kirby Muxloe); Erewash No. 3 (Milldale, Long Eaton); Mansfield D.C.; Nottingham No. 10; Rushcliffe No. 1; South Kesteven No. 8 (Grantham No. 25).

South East

Guildford No. 4; Luton No. 14; Milton Keynes No. 4 (Bletchley No. 7); Slough No. 18.

London Boroughs

Havering No. 9.

NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Northern

Gateshead No. 9; Langbaurgh No. 5 (South Bank, South); North Tyneside No. 7, No. 8, No. 9, No. 10 and No. 11; South Tyneside No. 3.

North West

Bolton No. 13 (Westhoughton Nos. 13 and 14); Chorley No. 3 (Ulnes Walton); Ellesmere Port and Neston No. 16; Oldham No. 27 (High St., Lees), No. 28 (Cowlishaw), No. 29 (Hollinwood) and No. 30 (Clough/Grains); Pendle (Barnoldswick No. 2); Rochdale No. 5 (former Middleton BC completions); Stockport No. 20 (South Reddish/Heaton Norris); Tameside (Stalybridge No. 20); Wigan (Orrell No. 1) and (Tyldesley No. 7).

Yorkshire and Humberside
Barnsley No. 21 (Baraugh), No. 22 (Mapplewell), No. 23 (Staincross) and No. 24 (Staincross); Calderdale No. 23 (Halifax Stump Cross/Northowram); Harrogate No. 5A (Killinghall Moor); Kirklees (Colne Valley No. 3); Wakefield (Normanton No. 3).

West Midlands
Coventry No. 21; North Warwickshire No. 5.

East Midlands
Ashfield No. 7 and No. 8; Bassetlaw (Worksop Area No. 6A) (NCB Manton); Blaby No. 12 (Glenfield South); Nottingham No. 9.

South West
Bristol No. 15.

South East
Bracknell No. 7 (Sandhurst/Ambarrow); North Bedfordshire No. 10; Southampton No. 19 (Bitterne Park).

London Boroughs
Hillingdon No. 35.

NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Northern
Gateshead No. 9; Langbaurgh No. 6 (South Bank, East); South Tyneside No. 3 and No. 4; Sunderland No. 17 and No. 18.

North West
Burnley No. 2; Chorley No. 3 (Ulnes Walton); Halton (Runcorn No. 13) (Parish of Moore).

Yorkshire and Humberside
Barnsley No. 24 (Staincross); Rotherham (Brecks); South Kesteven No. 10 (Grantham No. 26).

West Midlands
Coventry No. 21; Nuneaton No. 18 (St. Mary's Coton); Warwick No. 13.

East Midlands
Ashfield No. 8; Bassetlaw (Worksop Area No. 6A) (NCB Manton); Broxtowe (Eastwood No. 3); Erewash No. 5 (Rutland, Ilkeston).

South East
Guildford No. 5; Luton No. 15; Southampton No. 20 (Freemantle No. 2); Thurrock No. 15.

London Boroughs
Kingston upon Thames No. 27; Newham No. 15.

NORTHERN IRELAND

NEW SMOKE CONTROL ORDERS IN OPERATION

Craigavon BC No. 7; Newtownabbey UDC No. 9.

NEW SMOKE CONTROL ORDER CONFIRMED BUT NOT YET IN OPERATION

Belfast CC No. 14.

SCOTLAND

NEW SMOKE CONTROL ORDERS IN OPERATION

Edinburgh District (Royston No. 2) and (Colinton No. 5).

NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Edinburgh District (Drylaw No. 1) and (Royston No. 1); Glasgow District (East End No. 2) and (East End No. 3).

NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Dundee District (Wester Clepington); Nithsdale District (Lockside North).

SMOKE CONTROL AREAS

Progress Report
Position at 31st December 1978

(Figures supplied by the Department of the Environment, the Welsh Office, the Department of the Environment for Northern Ireland and the Scottish Development Department).

	England			Wales			Scotland			Northern Ireland		
Smoke Control Areas Confirmed to 30.9.1978	4,972			34			267			78		
Acres		1,704,061			3,331			148,754			18,955	
Premises			7,229,412			10,754			600,850			56,602
Smoke Control Areas Confirmed (30.9.-31.12.78)	41			—			4			—		
Acres		20,059			—			3,222			—	
Premises			7,207			—			11,235			—
Totals	**5,013**	**1,724,120**	**7,296,619**	**34**	**3,331**	**10,754**	**271**	**151,976**	**612,085**	**78**	**18,955**	**56,602**
Smoke Control Areas Submitted (30.9.-31.12.78)	25			—			2			—		
Acres		11,089			—			516			—	
Premises			57,209			—			6,374			—
Grand Totals	**5,038**	**1,735,209**	**7,353,828**	**34**	**3,331**	**10,754**	**273**	**152,492**	**618,459**	**78**	**18,955**	**56,602**
Smokeless Zones (Local Acts) in Operation	44			—			—			—		
Acres		3,400			—			—			—	
Premises			41,060			—			—			—

INDEX TO CLEAN AIR

(Vol. 8, Nos. 28-31) (Supplementary to Index inserted in 'Clean Air' Spring 1978)

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The Clever Moron. R. S. Scorer. Routledge & Kegan Paul, 1977. *Vol. 8, No. 27, Spring 1978, p.35.*

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East Midlands - Report of the meeting held at the Idlewells Centre, Sutton-in-Ashfield, 13.4.1978. *Vol. 8, No. 29, Summer 1978, p.35.*

- Report of the A.G.M. held at Peterborough, 22.6.1978. *Vol. 8, No. 30, Autumn 1978, p.21.*

- Report of the meeting held at the Council Houses, Nottingham, 18.9.1978. *Vol. 8, No. 31, Winter 1978, p.12.*

Northern Division - Report of the visit to the AGR Electricity Generating Station at Hartlepool, 1 and 8.11.1977. *Vol. 8, No. 28, Spring 1978, p.37.*

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Environmental Education - An Industrial View. A. J. Clarke. *Vol. 8, No. 30, Autumn 1978, p.5.*

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The Effects of Air Pollution. M. J. Gittins. *Vol. 8, No. 28, Spring 1978, p.19.*

HEALTH

Clean Air Council Statement on Chlorofluorocarbons. *Vol. 8, No. 28, Spring 1978, p.15.*

Health Effects of Lead: New Research Projects. *Vol. 8, No. 30, Autumn 1978, p.15.*

Local Authorities Check on Microwave Ovens. *Vol. 8, No. 31, Winter 1978, p.22.*

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'SAFETY OF CHEMICALS IN THE ENVIRONMENT'

Harwell is running a two-day seminar on 9th-10th May 1979. The event is the second in Harwell's series of environmental seminars, the first of which was the highly successful 'Major Chemical Hazards' seminar held at the Lorch Foundation, Lane End, Buckinghamshire in April this year. 'Safety of Chemicals in the Environment' is to be held at the same venue.

The aims of this seminar is: 'To examine the effects of chemicals in the environment with particular emphasis on the issues of control, production, use and disposal.' The seminar, which is expected to have an international appeal, will cover the following topics: origins of chemicals in the environment; detection and toxicology; effects and epidemiology; regulatory implications in the United Kingdom, Europe and North America; industrial viewpoints; ecological aspects, and future developments.

Further information about the seminar can be obtained from Mr. C. J. A. Preuveneers, Education and Training Centre, Building 455, Harwell, Oxfordshire OX11 0QJ. Telephone Abingdon (0235) 24141, extension 3106.

RECLAN 79

Conference on the Reclamation of Contaminated Land, Eastbourne 22nd-25th October 1979.

The Conference is directed at all those who may become involved in the practical solutions of the problems of reclamation of land that has been used for industrial purposes. The aim is to identify the problems presented by reuse of such land which has been contaminated by previous usage; to consider the contribution of the various disciplines and technologies involved in the successful rehabilitation of such land; and to make recommendations for further studies and actions.

Further programme and registration details will be published in April 1979. Contact: the Conference Secretariat, Society for Chemical Industry, 14 Belgrave Square, London SW1X 8PS.

INDUSTRIAL NEWS

Car Park Ventilation Systems

R. E. Tully, C.Eng, FIMech E, FCIBS, M Cons E, senior partner of G. H. Buckle & Partners, Consulting Engineers, read a Paper on 'The Design, Installation, Commissioning and Maintenance of Car Park Ventilation Systems', at an Autumn Seminar on 'Atmospheric Pollution in Car Parks' organised by the British Car Parks Association on 31st October at the Institution of Civil Engineers.

Other Papers read at the Seminar included a general review of the Occurrence and Characteristics of Pollution in Car Parks, the Monitoring and Control of Carbon Monoxide Emission in Enclosed Car Parks and the Implications relating to Car Parks of the Health and Safety at Work Act, all read by experts in these particular fields.

Mr. Tully's paper, based on practical experience gained during the design of a number of car park ventilation systems for which its partnership had been responsible, included a description and drawings relating to the large below-ground car park currently being constructed at the Barbican Arts Centre in London.

The Paper discussed design aspects with reference to statutory requirements, explained various problems met and their solutions and analysed the elements that should be reviewed during the design stage. It dealt with the type and quality of materials required for installations, stressed the importance of setting up and commissioning the installation as well as of subsequent maintenance and routine testing.

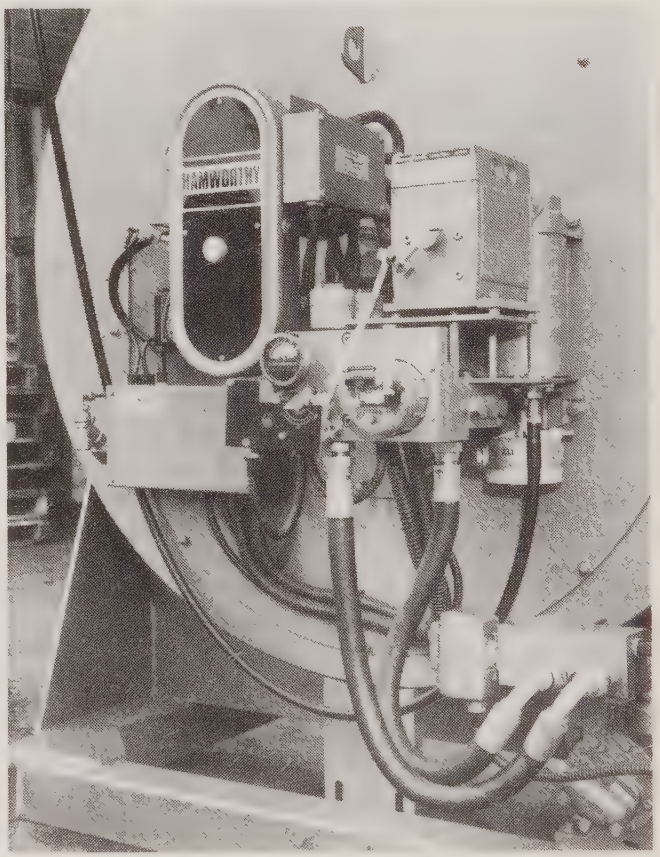
Reader Enquiry Service No. **793**

Orders Roll in for New Hamworthy Rotary Burner

A new rotary cup burner for industrial boilers, introduced in pre-production form by the Combustion Division of Hamworthy Engineering Ltd. – a Powell Duffryn Company – at HEVAC – the Heating, Ventilating and Air Conditioning Exhibition – at Birmingham in April, is rapidly proving its popularity.

A total of 79 have already been ordered, customers including leading home and overseas boiler manufacturers and a wide range of major user companies and undertakings.

Hamworthy now announce that the new burner – known as the Hamworthy AW – is going into full production and as from 1st January will take over from its existing range of AW1 oil, gas and dual fuel burners.



Although the AW1 range has been an acknowledged leader in design and performance in the industrial burner field for several years it was recognised by Hamworthy Combustion Division that changes of emphasis in energy conservation and fuel costs and coming changes in fuel characteristics would require basic modifications in burner design.

The new AW rotary cup burner has been developed after extensive tests to cater for these changes.

It was decided that the rotary cup burner remained the best type for the purpose. But among the basic changes in design is the inclusion of separate drives for the rotary and primary air fan. This removes restrictions on the cup speed which may, in the future, require adjustment for satisfactory combustion of alternative fuels.

Separate control over the pressure and volume of the primary air also means that the burner can be supplied with differing air/fuel momentum rates.

At present the new burner retains, within very close limits, the same cup speeds and momentum ratios as the existing AW1 burner so that it is capable of handling currently available fuel oils to British Standard specifications and meeting present environmental legislation covering flue gas emissions. At the same time the design is flexible enough to allow for continuous development to meet future changes in fuel characteristics and anti-pollution laws.

The new burner is designed particularly for shell boilers and smaller water tube units and as with the AW1 range is capable of gas, oil and dual fuel firing.

Reader Enquiry Service No. **794**

Interchangeable High-Performance Filter Elements

A new series of industrial filter elements for purifying liquids, gases and compressed air is being manufactured in nine standard sizes and 11 interchangeable fineness-grades by *Ultrafilter GmbH,* Dusseldorf, West Germany.

The elements comprise six grades with permanent, regenerable sintered-metal elements (bronze or stainless steel), for filtering relatively coarse particles from air, steam or liquids; and five high-efficiency grades with disposable two-stage or three-stage elements, for total removal of oil, water and dirt from air and gases, for odour removal, and for 100 per cent bacteria removal.

Reader Enquiry Service No. **795**

Automatic Surveillance of Dust Content in Process Discharge Gases

The Beta dustmeter is a radiometric instrument specially designed for measuring and recording the concentration of dust particles in gas flows in chimneys, stacks and ducts directly in units of weight per unit volume of gas without need for further data processing.

It is intended for applications where the efficiency of dust extraction and gas filtration must be maintained, for instance in coal and oil fired power stations; lime and cement kilns; steel plants; refuse incinerators; continuous glass making plants, etc.

It is particularly useful where toxic dusts must be kept below prescribed limits. The complete system which is available from Krohne Measurement & Control Ltd., Moulton Park, Northampton, consists of six units; a gas sampling unit; a dust mass sensor; a gas volume measuring and regulating unit; and electronic control unit; a sampling pump, and a chart recorder.

Gas samples are collected isokinetically by a sampling probe which is driven in an arc across the chimney by a small electric motor to ensure that the sample is representative under all conditions of flow. The sampling rate can be held proportional to the flow rate of the main stream by using interchangeable probe nozzles and by adjusting the sample volume flow velocity. Alternatively for less critical applications a fixed probe can be utilised.

Volume, pressure and temperature of the gas are held constant to ease the conversion to unit volume at normal temperature and pressure.

All particles exceeding 0.3 microns are retained by dense glassfibre material. The patch carrying the retained dust then moves back to the radiometric measuring unit, and its transmission rate is measured. Due to absorbed dust the signal from the counter will be lower than when clean. The quotient of the two signals after conversion to an analogue dc signal, is logarithmically proportional to dust content.

The measuring range for dust content determination is 0.50mg and since the sampling volume can be varied from 1000 to 50 litres, by adjustment of a timer, the overall range of the equipment can be adjusted from 0-10mg^3, to 0-1000mg/m^3.

Two versions of the equipment are available: the Type F50 (fixed installation version) and the Type F60 (transportable version).

The stationery equipment (with filter strip sufficient for about four weeks operation) is for the continuous monitoring of emission as proof of compliance with the requirements of clean-air legislation. The transportable version differs from the stationary one in that the dust measuring unit and the gas volume measuring and control units are housed in separate cases. This separation enables the equipment to be used for monitoring at several points.

Since the activity of the C14 beta-source is below 100 micro Curie no special precautions are necessary for its safe handling.

Reader Enquiry Service No. **797**

NSCA
WORKSHOP
ON

POLLUTION FROM ROAD VEHICLES

9th, 10th and 11th April, 1979

Warwick University, Coventry

HAVE YOU REGISTERED?

If not, contact: Sue Miles, National Society for Clean Air, 136 North Street, Brighton BN1 1RG. Tel: (0273) 26313

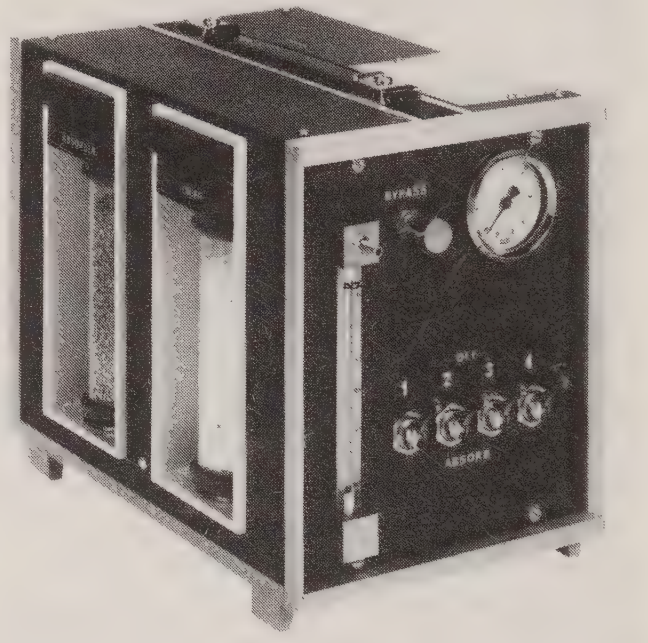
Gas Diluters for Plant Physiology and Atmospheric Pollution Studies

The new Type GD.600 gas diluter, manufactured by *The Analytical Development Co. Ltd.* of Hoddesdon, Herts, England, makes it possible to produce up to 14 accurately known reduced concentration from gas mixtures containing CO2, SO2 or NH3 in an air or nitrogen diluent. The lowest concentration obtained is typically 5-10 per cent that of the incoming gas mixture, and dilution accuracy is better than 0.5 per cent of input concentration. A second version of the instrument, the GD.601, has a heated catalytic converter to provide dilutions of mixtures containing up to 3000 ppm carbon monoxide in air; the converter oxidises the CO for absorption as CO2.

The range of standard gas mixtures generated by the instruments may be used to calibrate gas analysers of either the direct-reading or comparative type. They will also be of value to gas suppliers for standardising unknown cylinder mixtures. If fed with pumped atmospheric air, the GD.600 can also produce CO2 at sub-atmospheric concentrations for feeding to leaf-chambers and similar apparatus.

The new instruments employ a technique developed by Dr. K. J. Parkinson at the *Rothamsted Experimental Station*. The supply gas, entering the rear of the instrument at 1-2 bar g pressure, is divided into four unequal flows; these may then be routed, by means of four selector-switches, either through gas scrubbing and drying columns or else down a bypass line. The use of critical flow orifices, in which flow becomes independent of downstream pressure once supply pressure exceeds a certain value, ensures that flow rates are unaffected by which route is subsequently taken. The scrubbed and bypass flows are recombined before leaving the instrument. An individual calibration-card fixed to the case states the precise percentage of input-concentration that is obtained from every combination of selector-switches.

Any proportion of the outlet flow (which is shown on a 0.2-1.2 litres/min flow-indicator) may be bypassed to a second outlet to allow monitoring of its concentration, calibration of differential measurements across a photosynthesis chamber, or supply of two chambers from one source.



Reader Enquiry Service No. **798**

Industrial Exposure to Metals: Toxic Hazards and Deleterious Effects

The Occupational and Environmental Safety and Health Group of the Polytechnic of Central London is holding a one-day course on Thursday, 19th April 1979 entitled 'Industrial Exposure to Metals: Toxic Hazards and Deleterious Effects' (Organisers: Dr. P. Cohn and Dr. D. F. C. Linnecar).

The course is intended to meet the needs of chemical, technical and safety personnel in industry and the information provided should be of interest to all those concerned with the hazards of industrial exposure to metals in various chemical forms.

The course fee, including lunch and refreshments, is £28. Further details and application form from: Julia Kessel, Short Course Unit, Polytechnic of Central London, 309 Regent Street, London W1R 8AL. Tel. 01-580 2020 Ext. 220.

New High Efficiency Dust Filter – National Coal Board Invention

A filter for airborne dust, developed by the National Coal Board's Mining Research and Development Establishment (MRDE) at Stanhope Bretby, near Burton-on-Trent, catches about 93 per cent of the dangerous, fine 'respirable' dust (less than 5 microns in size) and is an even more efficient collector of coarser dust.

Typical wet collectors for dust have relatively high efficiency but only at an airflow close to their designed capacity. But the MRDE irrigated filter has the great advantage that it maintains its high efficiency over a 5 to 1 range of airflows. It has, also, low air resistance and is in consequence cheaper to run than most other commercial collectors.

Water is injected into the exhaust fan upwind of the dust collector and the resulting air-entrained spray is carried with the airborne particles on to a special filter panel, which is made either of fine entrapped fibres or of stainless steel and has a very open structure (about 98 per cent free volume). The fine spray strikes the wetted fibres and the water with entrapped dust drains down through the panel and in part is carried off its back surface as dust-laden droplets, which are collected in a mist eliminator built into the unit.

This combination of irrigated panel and water eliminator enables dust to be captured efficiently under air velocities ranging from 1m/sec to 5m/sec without water carryover – providing a very compact and versatile unit. Water gravitates into a sump at the base of the unit. Recirculation of the water greatly reduces the disposal problem and only about 150 litres of dirty water need to be emptied, perhaps once a week. The sloping bottom of the sump ensures that mud deposited at the deep end is not picked up by the recirculating pump, whose suction is at the shallow end. The basic unit is thus a pump, coarse injector jets, fan, filter panel and sump. The unit may be obtained with an integral fan, or with provision for a separate fan.

Although designed for underground work and consequently completely flameproof and anti-static, this neat, compact, efficient unit has also been installed in industries above the ground where a wet collector is needed, as well as in non-coal mines.

The maximum respirable dust concentration allowed in an underground drivage is 5mg/m^3, reduced to 3mg/m^3 when quartz dust is present. The use of exhaust ventilation with these dust collectors to control dust is rapidly increasing and is proving most effective. Some 900 dust collectors are installed underground in the NCB's 231 collieries, about 300 of them being MRDE irrigated filter units.

Makers of the NCB/MRDE dust filter are Engart Fans Ltd., Hirwaun Industrial Estate, Aberdare; Erewash Engineering, Pinxton, near Alfreton, Notts.; and Western Precipitation, Epsom, Surrey.

Reader Enquiry Service No. **799**

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OLD THEME - NEW SOLUTION

At the present time the Society is organising a Workshop on Pollution from Road Vehicles which will deal with the vexed questions of diesel smoke, lead in petrol and traffic noise, a Teach-in about neighbourhood noise and a Conference which will have as its theme, the weather and air pollution. Nevertheless we do have to come back to the basic concern of smoke control which some now regard as complete if not outmoded. The point is, of course, that smoke control has by no means been achieved although the number of authorities that have completed their smoke control programmes is steadily increasing. And it is not outmoded, for although some authorities are going ahead with their programmes, there are some who have not yet made a start 23 years after the 1956 Clean Air Act came into force!

Since 1975, 'black' and 'white' areas no longer exist but it is now apparent that there are still some areas in the country which are very dark grey if not black, and some areas which are unlikely to reach the standards required by an EEC Directive about particulates and sulphur dioxide.

If this Directive is accepted, as we expect, then it will be necessary for the Government either to show that there is adequate legislation to impose the criteria required, or if necessary introduce new legislation. It has been recognised that the proposed standards might be met by insisting on further smoke control programmes, in which case it may be necessary for the Secretary of State to use his powers under the Clean Air Act of 1968 and to require some local authorities to institute smoke control programmes. The Secretary of State has so far never used this power; the time is approaching when he may have to do so.

It is 23 years since the 1956 Clean Air Act came into operation and so perhaps it is time that some action is taken to stimulate local authorities to complete their programmes all over the country. It is suggested that a time limit might be introduced, at the end of which all local authorities will be expected to have completed their programmes and after which no grants will be paid from central government. We would suggest that the end of 1985 seems a suitable date; after all, this would allow 30 years for the completion of smoke control throughout the country - more than twice as long as the Beaver Committee originally envisaged.

But perhaps some incentive is also required. It is well known that the official figures for smoke control do not reflect the true position in the country. There are many premises not included in the official returns which are subject to smoke control and for which neither central government nor local authorities have paid any grant. In some cases the necessary appliances have been installed by far-sighted people who believe in smoke control; in many cases, householders have installed a more modern and efficient system of heating which has also complied with smoke control regulations. There has been a long and continuing debate as to whether or not such people should be entitled to smoke control grants. It has long been recognised that it would be only fair to pay grants in these cases, but the objections have always been that it would be difficult to do. Houses may have changed hands; if a grant is paid for conversion of premises in an area not officially smoke controlled, there is no guarantee that the premises will not be reconverted. We feel that these are administrative difficulties which with thought and application could be overcome, and we would suggest that some means of paying such grants should be incorporated with the time limit already suggested.

NEW OIL REFINERY THREATENS TAJ MAHAL

by

Dr. C. P. Prakash,

President, Indian Association for Air Pollution Control

Reprinted by kind permission of the International Union of Air Pollution Prevention Associations, from IUAPPA Newsletter, *Vol. 4, No. 19, February, 1979.*

To meet the growing demand for Petroleum products in the North-West region of our country, the Government of India decided to set up a 6 million tonnes oil refinery (Rs.300 crores project) with Soviet collaboration at Mathura 40km away from Agra. The foundation stone of this refinery was laid by the then Prime Minister of India on 2nd October, 1973 and it is expected to be completed by December, 1979 and commissioned in April, 1980.

The Mathura oil refinery is designed to process Middle-East crudes having sulphur content less than 2 per cent. Depending on the availability of indigenous crudes, the oil refinery proposes to process up to 3 million tonnes per annum of Bombay High Crude and also an additional 3 million tonnes of imported crude. The refinery will have the following installations: Desalter, Atmospheric Distillation Unit, LPG Treating Unit, Naptha Treating Unit, Naptha Caustic Wash, Kerosene Treating Unit, Visbreaker, Vacuum Unit, Fluid Catalytic Cracking Unit, Bitumen and Sulphur Recovery Units. Considering the various processes of an oil-refinery, it is obvious that there are several potential sources of water and air pollution.

It is estimated that the air pollutants emitted by the Mathura oil refinery will be as follows:

Air pollutants	Emissions (tonnes per day)
CO	80-240
SO2	60-180
SO3	2-4
Hydrocarbons	60-120
Nitrogen oxides	2-6
Particulate matter	6-20
Ammonia aldehydes	—
Organic acids	2
Aerosols	—

Besides giving rise to emissions of several air pollutants, the oil refinery will also lead, sooner or later, to further industrialisation and urbanisation in the region. The concomitant increased level of air pollution up-wind at Agra may prove quite harmful to Taj Mahal and its environs.

The Taj Mahal, therefore, faces the gravest danger of its existence. It is already in the throes of gradual decay owing to air pollution from the mushrooming industrial complexes in the region. Coal dust, sulphur dioxide, smoke and other wastes from the foundries and power plants nearby threaten to turn it into a disintegrating black replica of the Taj. But by far the greatest threat to the Taj is from the Mathura oil refinery.

Among the effluents the oil refinery is likely to discharge into the atmosphere are stack gases, petroleum vapours and catalyst particles. The emission of petroleum vapours, it is stated, does not pose health and environmental problems owing to the using of floating storage tanks. Similarly, catalyst particles are relatively harmless. Though emitted in powder form, they are inert synthetic material, chemically akin to clay, and have no corrosive properties. The chief pollutant is the sulphur dioxide contained in the stack gases. In combination with water vapour in the atmosphere, sulphur dioxide produces sulphuric acid. The long-term effect of this on white marble, red sand-stone, and other monuments, would be to corrode them. The corrosion is known as 'Cancer of the marble'. Dr. Giorgio Torraca, an Italian expert on stone preservation and Assistant Director of an UNESCO organisation in Rome has said that there could be no safe limit of SO2 concentration with respect to marble. Even a small quantity of the gas is enough to corrode it.

Mr. D. E. Orlov, Soviet petrochemical expert and the Chief Designer of the Mathura oil refinery has, however, said that there is no threat to the Taj Mahal from the oil refinery, adding that it has been determined that anything located beyond 25km from the oil refinery would not be affected by the polluting gases and that there was ample provision for installing special equipment in the refinery which would absorb the polluting gases.

The Archaeological Survey of India (ASI) responsible for the preservation of historical monuments, fears that the emissions from the refinery will discolour and wear away the white marble of the Taj Mahal, as also the red sand-stone used in Itmad-ud-Daulal's tomb, Fatehpur Sikri, the Sikandra and Agra Forts. The ancient temples of Mathura, in the vicinity of the refinery may also be affected.

The Government of India engaged an Italian firm TECNECO, which specialised in research on the effects of sulphur dioxide and its derivatives on marble monuments, to make on-the-spot studies to determine, among other things, the existing level of pollution in the Agra zone. TECNECO computed on the basis of a number of assumptions, the long-term concentrations of SO2 as 0.5 to 3.0 u/m^3 at Agra and ruled out, in its final report, any potential danger to the Taj from the oil refinery.

The Indian Meteorological Department (IMD) at the same time undertook to calculate the resultant ground-level concentration of sulphur dioxide in the area and suggested that for an emission rate of 5 tonnes per hour from the refinery, and the stack height of 100m, the following would represent the probable concentration values:

Stack height (metres)	**Concentration, ug/m³**			
	Short-term (1 hour)		Long-term (1 year)	
	5-6km	40km	1-3km	40km
100	500	100	34	2
40	1300	180	141	3.2

The above figures represent peak concentration values under worst meteorological conditions. The computations, which were done for all seasons of the year, reveal that the worst conditions would occur in winter, with light north-easterly winds of 3m/sec based on Delhi wind data.

The National Environmental Engineering Research Institute (NEERI) estimated the existing levels of sulphur dioxide at Agra as 15 to 20 u/m^3 on an annual average. NEERI estimated the projected long-term levels of SO2 at Agra to be 0.06 to 0.13 u/m^3 for 1 tonne and 0.3 to 0.64 u/m^3 for 5 tonne emission rates and short-term concentrations to be 2.22 to 19.9 u/m^3 for 1 tonne and 11.10 to 99.00 u/m^3 for 5 tonne emission rates.

The findings of the TECNECO, IMD and NEERI, however, were based on the winds data, not of Agra but of Delhi, and the mathematical models, which were developed abroad, and the constants used, did not take into account the local temperatures and weather conditions. Significantly, the TECNECO, IMD and NEERI reports have not yet been published for discussion by MPs, scientists and engineers, or for review by air pollution experts and agencies, either in India or abroad.

The Petroleum Ministry of the Government of India constituted an Expert Committee with Dr. S. Varadarajan, Chairman of the Indian Petrochemicals Corporation Ltd., Baroda (IPCL), as chairman, to advise the Indian Oil Corporation Limited, the project authority, 'on the measures to be taken for keeping the pollution effects to the minimum'. The Committee have come to the conclusion that the Mathura oil refinery will not constitute a serious pollution hazard to the Taj Mahal. The Committee have also stated that there is no likelihood of adverse effect either on the birds or on plant life at the Bharatpur Sanctuary on account of the oil refinery. The Committee have further stated that since basically low-sulphur fuel will be used in the furnaces of the Mathura oil refinery, it will be possible to ensure that the actual emission of sulphur dioxide is limited to 1 tonne per hour. According to the Committee, the refinery's contribution to long-term sulphur dioxide concentration at Agra would be 1 to 2 u/m^3 compared to the existing level of 15 to 20 u/m^3. Modern technology used in the oil refinery, it is stated, will effectively control particulate emission from the oil refinery stacks. The Committee's report is said to be still under examination in consultation with the Government departments concerned and the Government's view would be known thereafter.

The Archaeological Survey of India (ASI) does not agree with the findings of the Varadarajan Committee. Its own investigation shows that the devices installed by the Indian Oil Corporation Ltd. (IOC) are not enough to protect the Taj Mahal from corrosion. The ASI further states that to prevent the fall-out IOC will have to run its stack gas desulphurisation plant non-stop, which will be impossible. The ASI, however, concedes that the marble can be protected from 'corrosive acid rain' by means of a coat of preservative put on every few years. How long this shield would remain intact would depend on the rainfall in Agra and the abrasive action of the sand and dust in the air. To paint over the Taj Mahal, very high scaffolding will have to be raised. This work, which is costly and time consuming, will detract from the beauty of the Mausoleum and will require experts to implement it.

The work on the construction of the oil refinery is going on and as per its present schedule it is likely to be completed by December, 1979. There is, therefore, hardly any time left now to decide finally about the location of the oil refinery in view of the threatened pollution hazards to the Taj Mahal. It can only be hoped that the Government of India at the time of taking a final decision would keep in mind the experience gained in such matters in other countries and would have before it all the relevant data for a correct appraisal of the likely effect of pollutants emitted by the oil refinery on the Taj Mahal and other important buildings and also on the health of the plant, animal and human life in the Delhi-Mathura-Agra area.

WEATHER AND AIR POLLUTION

1979 Clean Air Conference

The 46th Clean Air Conference will take place in **Scarborough, 15th-18th October, 1979.**

The theme is 'Weather and Air Pollution' and the programme has been planned to provide a varied and interesting approach to topics which are essential to the understanding of air pollution and its control.

Jack Scott, well known TV 'weather-man' will open the conference session on Tuesday morning (16th October) with a general paper on *weather and how it is formed.* **Dr. F. B. Smith,** also of the Meteorological Office, will discuss *general weather forecasting* leading to *forecasting of weather which has specific effect on air pollution:* for example, fog and back trajectory.

On Tuesday afternoon, **Professor R. S. Scorer,** expert on the subject of air pollution and diffusion, will show a *visual presentation of the effects of weather on pollution.* He has collected some stunning colour slides in the course of his work, and these will provide vivid images to pinpoint the subject of the conference.

Dr. A. J. Moore, of the Central Electricity Research Laboratory (CERL), and **A. J. Clarke** of the Central Electricity Generating Board (CEGB) will give an explanation of the *effect of different weather conditions on emissions at different heights,* dispersal, chimney plumes, etc. This work is central to the calculation of chimney height, as weather is the most difficult variable in any prediction of pollution from a point source.

On the morning of Wednesday, 17th October, **Dr. A. W. C. Keddie,** Head of the Air Pollution Division at the Department of Industry's Research Laboratory, Warren Spring, will present an historical *review of monitoring, including National Survey, later, and current surveys.* **Dr. R. Varey** of CERL, and **Peter Owens,** NE Region, CEGB, will discuss *advanced measurement methods and special applications:* laser, lidar, etc. The work on the measurement of particulates in conjunction with Selby DC will also be reviewed.

The Wednesday afternoon session has the theme 'Noise and Weather'. **Professor J. B. Large** of the Institute of Sound and Vibration Research at Southampton University will assess *the effects of weather on noise in terms of propagation and measurement.* **Peter Sutton,** of Esso's Fawley Refinery and author of *The Protection Handbook of Industrial Noise Control* will examine *the effect of weather on noise assessment.*

On Thursday morning (18th October) *the accuracy, interpretation, and use of results* obtained from monitoring and measurement will be presented in a paper by **Dr. J. M. A. Schwar** of the GLC's Scientific Branch.

The *effects of pollution on weather* is the final subject for discussion with a paper by **Dr. B. J. Hoskins** of Reading University, entitled *Will Pollution Change the Climate?*

Reader Enquiry Service No. **7912**

NEW BOOKLET COMPARES FUEL COSTS

The latest information on the cost of home heating with different types of fuel is available in a new edition of *Compare Your Home Heating Costs,* published by the Department of Energy.

The booklet gives the separate costs of installing and running a separate hot water system; heating just one room and installing and running whole-house heating systems in a two-bedroomed terraced house and a three-bedroom semi, with and without cavity wall insulation. Each case is costed in terms of oil or paraffin heating, and various types of solid smokeless fuel, gas and electric heating systems and appliances.

The booklet emphasises that good insulation and proper controls on heating systems can cut fuel costs, and offers a guide to how cost-effective different methods of insulation are in general. It also explains how to check fuel bills and meters and what financial assistance is available from the Government under the recently introduced Homes Insulation Scheme.

The Homes Insulation Scheme provides a grant from local authorities towards the cost of installing 80mm (3in) of loft insulation where there is none already and the lagging of water tanks, pipes and hot water cylinders. The maximum grant is 66 per cent of the cost of materials and work, or £50, whichever is the less. Applications for the grant should be made to local authorities before starting work.

As with the previous edition, the booklet is issued in four separate regional versions – Southern, Midlands and Northern, Welsh, and Scottish – and is based on local fuel prices and temperatures in London, Leeds, Cardiff and Glasgow. It contains a list of useful addresses for further advice on home heating, and is available free from the Library, Department of Energy, Thames House South, Millbank, London SW1. Telephone: 01-211 3394/4679/5840.

NEW CHAIRMAN OF THE EHA GENERAL COUNCIL

Mr. Alan Eames, Chief Environmental Health Officer to North Wiltshire District Council has been elected to be the 1979 Chairman of the General Council – the governing body of the Environmental Health Officers Association.

With the exception of three years' military service in the Royal Engineers, Alan Eames has spent his entire career in local government and trained and qualified with the City of Birmingham before pursuing his career with a number of local authorities in the Midlands and West of England.

Having always taken an active part in EHA affairs, Alan Eames has served as Centre Secretary and Chairman of the Western Centre of the Association. He joined the General Council in 1969 and has served on its Public Relations and Conference and Education Committees; currently he is Vice-Chairman of the Education Committee.

He is also a member of the Environmental Health Officers' Education Board and acts as a Technical Adviser to the Association of District Councils. He is a member of the National Poultry Working Group and the Advisory Committee on Food Standards.

In 1977 he served as an Expert on the EEC Committee considering the qualifications of non-veterinary personnel in connection with the inspection of poultry and meat products in the United Kingdom.

LETTER TO THE EDITOR

Dear Sir,

In his letter *(Clean Air, Winter 1978)* Mr. Byrom Lees made some very kind comments and asked several questions relating to my paper, Monitoring Particulate Emissions *(Clean Air, Summer 1978).* May I ask for a little space to reply?

It is true that the emission of particulates from plant burning heavy fuel oils from different sources does vary considerably, as pointed out by Munro, Westlake and Lewis[1] and others, but no one has yet determined – in spite of considerable research effort – exactly what fuel characteristics(s) affect the emissions. Of late considerable publicity has been given to the role of asphaltenes, loosely defined as the very high molecular weight compounds of high carbon content found in fuel oils. The papers by Munro *et al* and Cunningham and Jackson[2] show in carefully controlled tests that asphaltenes are not the only factor and the general conclusion is that control of asphaltene content alone will not give control of particulate emissions, or ensure that two batches of fuel will give reproducible emissions, even between carefully controlled test plants.

Mr. Lees also asks 'should the fuel oil used for the determinations be a special consignment which has previously been examined on a special test rig?' The practical difficulties of segregating and storing such a fuel perhaps for very long periods, and then delivering it using cleaned vehicles into the consumers' cleaned tanks are self evident, but in any case much of the research on emissions has frequently illustrated that the emissions determined on a test rig are not consistently related to the emissions from the multitude of boiler types and installations.

No supplier can guarantee that any two consignments of fuel oil will have identical characteristics, since they will be governed by the crudes available at any time, but in any case from the above it follows that they cannot produce a 'standard' fuel so far as emissions are concerned, an argument which is equally applicable to coal supplied to solid fuelled equipment.

Heavy fuel oils are, of course, what is left after the refiner has extracted from crude oil the higher quality products, and their (still) low price reflects this. Any additional processing must of necessity add considerably to the cost.

Having answered as best I can the questions posed by Mr. Lees I must stress that although the fuel characteristics can affect emissions, other factors directly under user control have a *far greater* effect, as mentioned in my paper, i.e. the design (and matching) of the boiler and burner, the quality of atomisation and the manner in which the plant is operated. Given proper attention to these points it is possible to burn commercially available fuel oil with emissions meeting the UK standards and even the more stringent European standards.

This brings me to the plea of Mr. Lees to install collecting cyclones in the stack of breeching at a cost of about £1,000 for a small packaged boiler.

I do not think it is the best approach to accept inadequate and inefficient combustion and subsequently clean up the resulting flue gases. As a result of poor combustion, boiler deposition will increase markedly leading to lower heat transfer and loss of efficiency,

more frequent need of cleaning, etc. My preference and that of the burner manufacturers, who have made considerable progress in burner design for emission control, is to spend a little more on producing combustion equipment which will satisfactorily burn commercially available fuels efficiently and with emissions within the statutory limits.

Having said that, I think the in-built cyclones may have a significant role to play, especially for existing plant, be it oil or coal fired, which is not quite up to standard but which has many years useful life in it. It is an intriguing idea to use cyclones to measure emissions levels, although I have a feeling that it will be some while before a controlling local authority or Alkali Inspector will allow the fine dust and fume passing the cyclone to be calculated rather than measured. However it may well come and I'm sure we shall see more and more of these cyclones fitted in the future.

Yours faithfully,

H. M. Ashton
Esso Petroleum Co. Ltd.

References

[1] Munro, A. J. E., Westlake, D., and Lewis, A., The conservative use of liquid fuel. J.Inst. Fuel, 1978, 51, 10.

[2] Cunningham, A. T. A., and Jackson, P. J., The reduction of atmospheric pollutants during the burning of residual fuel oil in large boilers. J. Inst. Fuel, 1978, 51, 20.

INSTITUTE OF FUEL CHANGES NAME AND DIRECTION

The Institute of Fuel has now become the Institute of Energy and the designatory initials of members have been changed to read FInstE (fellow) and MInstE (member) as appropriate.

The change of name from the Institute of Fuel to the Institute of Energy is not a change of name alone but signifies a positive shift of emphasis. Hitherto, although members of the Institute have been involved in all fields of energy, including alternative sources, the Institute has tended to be identified with conventional sources alone and with a natural bias towards fossil fuels.

It is the intention of the Institute of Energy more visibly to be involved in the whole spectrum of energy, including, for example, nuclear energy, energy policy and energy management. Indeed, the recent election of Sir John Hill chairman of the United Kingdom Atomic Energy Authority, to be a vice-president of the institute, from 1st May, 1979, is no coincidence.

Sadly, though, the Institute does not, amid this array of new interests, retain its former interest in air pollution abatement and control. In the year when the Commission on Energy and the Environment was appointed, the Institute gave up their membership of the National Society for Clean Air. This indicates a lack of concern for the environmental consequences of energy use which is, to say the least, regrettable.

ENERGY AND THE ENVIRONMENT – THE PUBLIC DEBATE

by

SIR BRIAN FLOWERS, FRS,

President of the National Society for Clean Air, Chairman of the Commission on Energy and the Environment, Rector of the Imperial College of Science and Technology

Sir Brian Flowers (now Lord Flowers, FRS) delivered this Presidential Address at the Opening Session of the 45th Clean Air Conference, Brighton on Monday, October 2nd, 1978. Since that time, the Society has been asked to submit evidence on coal usage to the Commission on Energy and the Environment (Coal Study). This the Society has now done, and we feel that our readers will welcome the opportunity to study the full text of this important Presidential Address.

One of the advantages of wearing two hats, if I may mix a metaphor, is that it allows one to tell the left hand what the right hand is doing. I would like to use the occasion of my Presidential Address to tell the National Society for Clean Air something about the problems which face me in my other guise as Chairman of the new Standing Commission on Energy and the Environment.

Our wide-ranging terms of reference are 'to advise on the interaction between energy policy and the environment'. Since the Commission has only met once you will understand that it is not yet possible for me to give an account of its activities and its conclusions, but the need for this new body, its broad objectives, and some of its problems, are clear enough. They were foreseen with admirable clarity by Lord Nathan in his report of a Working Party set up jointly by the Committee for Environmental Conservation, the Royal Society of Arts, and the Institute of Fuel, published in July 1974 – a Report that has worn singularly well. Its opening sentence reads: 'A policy for the development of energy resources must be created in the context of its environmental and social consequences.' It goes on to say: 'Protection of the environment cannot be separated from the other objects of a policy for energy; the present skirmishing between environmental interests and the energy industries benefits neither side'.

Of course, the problem is not a new one as this Society knows very well. In their delightful study of the origins of the Clean Air Act, 1956, which finally removed smog from our cities, Lord Ashby and Dr. Mary Anderson suggest that preparation for the Act began as long ago as 1819 when Parliament appointed a Select Committee to enquire 'how far it may be practicable to compel persons using steam engines and furnaces in their different works to erect them in a manner less prejudicial to public health and public comfort'. With a wealth of fascinating detail they tell how it took from then until the Great London Smog of 1952, nearly a century and a half, to mobilise public and Parliamentary opinion sufficient to bring about effective legislation, in spite of innumerable Reports of Committees and Royal Commissions, pressure groups, abortive Bills, and attempted prosecutions under unsatisfactory legislation before unsympathetic magistrates.

The conclusions of Ashby and Anderson's study of smoke control were threefold. First, there had to be adequate scientific knowledge and a practicable technology. The science was known to Parliament as long ago as 1843: one simply had to achieve complete combustion, which incidentally saved fuel. 'The technology, too, was known in principle: for steam furnaces it was a matter of design and efficient stoking; for domestic fires it necessitated the use of closed stoves, common on the Continent, or burning coke or anthracite, but the air was regarded as free . . . and industrialists were not going to spend money on smoke abatement, nor were householders going to give up their cherished cheerful open fire, without compulsion. These were social, not technological obstacles.' In passing, one may note the same phenomenon today, with many Americans loath to give up their huge gas-guzzling automobiles on which their way of life depends, in the same way that Britons earlier refused to give up their 'pokeable, companionable fire'.

Ashby and Anderson's second conclusion was that it is difficult to pass a law unless there are effective means of enforcing it. In the case of smoke control, and I would say of environmental protection generally, one is dealing with many subjective factors in trying to rid oneself of nuisances which cannot easily be measured or even defined. There has to be the social will to overcome these difficulties. Smoke abatement is possible not so much because one can nowadays define clean air, but because it is 'becoming one of the expectations of industrial society. By general consent it is an unsocial act to emit smoke'.

And this leads to their third conclusion, which was that the measures to be taken have to be politically practicable. 'Only a government can protect air and in a pluralistic democracy no government will act without a substantial backing of public opinion. The cost of cleaner air was not only a money cost; it required also a certain surrender of private liberty for the public good: the liberty to pollute. Social values and traditional habits had to be changed before these costs would be paid. Credit for generating this change goes to the tiny minority of enthusiasts . . . whose persistence and vision have surmounted indifference, hostility and the pressure of vested interests'. And, of course, they paid tribute to the National Society for Clean Air and its forebears.

The role of public debate, in other words, was crucial in bringing about abatement, as it is proving again today in many other aspects of environmental protection. I will cite just two examples: the public protest against noise near airports, which has led to radical redesign of aircraft engines and their introduction before it might otherwise have been economically desirable; and the public concern about the long-term disposal of nuclear waste which in the last few years has forced the nuclear industry to pay far more attention to the nuclear fuel cycle in the light of waste management. In both cases the science was largely known, and much of the technology could be foreseen. It was the will that was missing, and this was supplied by public opinion led by the persistent few.

Governments are more responsive to public opinion nowadays, so the time scale for social and legislative change may be shorter than it was with smoke abatement. But the lesson appears to be the same, that informed public opinion is needed if technology is to be environmentally acceptable.

Before I pass to the proper subject of my address I would like to pay tribute to those like Mr. Tony Benn and Mr. Peter Shore who are genuinely trying to discuss in public the policy issues for which they are responsible. There are many in industry and in the government who still think that decisions are best taken by experts behind closed doors.

From the point of view of reaching a quick decision they may be right. But that usually means relying upon vested interests, or their supporters in Government, to take decisions; and it is by no means evident that the result is one that accords with the wishes of others, such as the consumer, or those who care for good management of the environment, or the public at large.

In the end, major technological choices are political choices to be made by politicians. It should be something to rejoice in that ministers are gradually demanding to have exposed all relevant aspects of a problem before they take their decisions. The only way they can be sure that all aspects have been exposed is to encourage public debate. This should not be seen as delaying tactics, but as an attempt to set, and then to reach the most desirable objectives with as much public consensus as possible. It is part of our developing democratic process. And it is in part a consequence of the educational system that an ever more educated public wishes to be consulted about decisions taken on its behalf.

I see the main function of the Commission on Energy and the Environment to be to contribute to the background against which informed public debate can take place.

Let me first of all discuss energy, and in doing so I shall take as my starting point the Government's Green paper on Energy Policy published in February. Energy supply and demand forecasts are very difficult, and have been notoriously unreliable in the past – one of the reasons we have an excess capacity for electricity production at the present time, combined with an underdevelopment of our coal resources. However, the oil crisis of 1973 has focused attention sharply on the whole range of energy problems, with the result that prediction is becoming a more sophisticated and, one hopes, a more reliable business. One of the most noticeable consequences has been the sharply reduced rate of growth now foreseen for energy demand, which, combined with a recognition that conservation of resources can make an important contribution, has led to much smaller predicted growth rates for energy supply than was the case only a few years ago. Although not without its critics, the Green Paper represents the latest stage of Government thinking on energy supply until the end of the century. Let me therefore try to summarise it.

First, the world background. It seems certain that oil, the dominant fuel of most industrialised nations, will become increasingly scarce and expensive during the rest of the century, and beyond. By the year 2000 it will almost certainly have ceased to be the world's marginal energy source as it is increasingly set aside for other purposes such as transport and petrochemical feedstock. Its place on that time scale can only be taken by coal and by nuclear electricity. Although coal resources as such are very considerable, it is doubtful whether they can be mined at such a rate as to make a substantial contribution from nuclear power unnecessary. Indeed, it is foreseen that there may be a requirement for nuclear power which, on present uranium supply prospects, cannot be satisfied beyond the year 2000 with the present kinds of thermal nuclear reactor which burn less than 1 per cent of the uranium fuel. The alternative energy sources of which one hears so much – wind and wave power, solar power and fusion – are unlikely to make a significant contribution before 2000. Unless energy conservation is accepted to such an extent that it radically alters our life styles and economic prospects in the meantime, it is likely that fast breeder reactors will be needed from about 2000 onwards since their uranium utilisation is greater than that of thermal reactors by a factor of 50 or more. At least, with alternative sources undeveloped as they now are we cannot *rely*

upon things being different then; supply policy, as distinct from research and development, can only be based upon what has been reasonably established through proven technology.

So far as the UK is concerned, the most striking feature of the supply situation is the prospect of 10 to 15 years of net self-sufficiency in energy from about 1980. The UK has substantial reserves of oil and gas and very large reserves of coal. But when North Sea oil and gas begin to turn down during the 1990s the UK will face a return to imported oil which is then likely to be both scarce and expensive. Like other nations we therefore have to effect a transition to an economy in which energy conservation, coal, nuclear power, and perhaps some of the renewable sources, are seen to be more important than at present. The Green Paper underlines the danger of allowing a temporary abundance of supplies to obscure the seriousness of the longer term prospects, particularly remembering that the lead time to develop even the well understood energy sources is long. It takes, for example, about 10 years to develop a new colliery, and about as long to build a nuclear power station.

The Green Paper assumes that the main influence on energy demand is likely to continue to be the rate of economic growth. Two growth cases are considered. In the higher case, which envisages 3 per cent average annual growth of Gross Domestic Product, total fuel demand is seen as rising from the equivalent of 340 million tons of coal in 1975 to 560 million tons in year 2000, or about 2 per cent growth a year in fuel demand. In the lower case of 2 per cent annual growth of GDP, primary fuel demand would reach 450 million tons, or about 1 per cent growth in fuel demand.

It is here, I believe, that the Green Paper's assumptions require very careful analysis and criticism, because it is only in the detailed demand forecasts that one can take into account the full range of energy conservation measures, both domestic in terms of house insulation and central heating, and industrial in terms of matching the form of energy supplied to the industrial process and in adopting processes which are intentionally less demanding of energy. Demand forecasts such as those of Gerald Leach of the International Institute for Environmental Development, and of Cheshire and Surrey and the Science Policy Research Unit of the University of Sussex suggest that energy growth even lower than that considered as the low case of the Green Paper may be sufficient without affecting overall economic growth. And it is well known that different countries use different amounts of energy to achieve similar levels of economic growth and standards of living. Britain uses more energy on this basis than Sweden and France.

It is here too that one should discuss the desirable levels of electrification. Because only about 35 per cent of the energy of the primary fuel is converted into electricity in a power station, it would often be less wasteful of primary fuel to use it directly rather than to convert the electricity back into heat again. Some people seem to assume without question that 100 per cent electrification is desirable. But if one were to use electricity only for applications where it was unquestionably best, such as lighting, telecommunications and traction, provided one could use primary fuel efficiently elsewhere, one might get away with only 10 per cent electrification. The range is so great that within it the requirement for massive development of nuclear electricity, for example, could be postponed for a long time. In this country where is no policy for electrification, except to allow it to be determined by consumer demand in response to the competing claims of the suppliers. It seems at least worthwhile to ask whether a more determinate policy would be beneficial.

The Green Paper identifies supply options which might yield a total of about 500 million tons of coal equivalent of indigenous energy in the year 2000 if all were successfully developed. This is sufficient for the case of low growth, but would have to be supplemented with imports in the high growth case. To take into account changing circumstances a flexible range of supply options is in any case necessary.

As far as indigenous coal is concerned it is estimated that total recoverable reserves are 45,000 million tons, sufficient to support the present rate of extraction for 300 years. The limitation, however, is not in the reserves but in the achieveable rate of extraction. Production last year was only 120 million tons. To achieve a production of 170 million tons in year 2000, annual investment of £400 million would be required to provide the 4 million tons of new capacity required each year.

The Green Paper argues the need to ensure that the capability exists rapidly to expand the supply of nuclear electricity from the late 1980s onwards if that course proves economically desirable and otherwise acceptable. Certainly, few would wish to throw away the nuclear option altogether. This requires a proven thermal reactor system such as the British AGR or the American PWR and an adequate nuclear manufacturing industry. The largest programme which it is now thought prudent to embark upon would amount to 30 nuclear stations in year 2000 (not including any contributions from a possible FBR), equivalent to nearly 90 million tons of coal. This is very much less than was contemplated by the nuclear industry only five years ago when the Royal Commission on Environmental Pollution was taking its evidence.

Regarding oil, the Green Paper states that the Government should seek to ensure that there is neither too sharp a peak nor too rapid a rundown in production. They should also support further research and development into recovery from oil fields where an improvement of each per cent could mean increased production worth £5 billion. Estimated total reserves of the British continental shelf are in the range of 3,000 – 4,500 million tons. Production during the 1980s is expected to lie in the range 100-150 tons per annum, equivalent to 170-250 million tons of coal.

The Green Paper argues that the development of natural gas reserves should be managed with a view to maintaining supplies to the markets, including the petrochemical markets, which can make best use of the special qualities of gas. Techniques for developing substitute natural gas from coal have been developed but further research and development is needed to guarantee them. The level of ultimately recoverable reserves is uncertain but is thought to be around 4,000 million tons of coal equivalent. Production of gas was about 60 mtce last year and is likely to increase somewhat in the future.

Energy conservation is now seen as an integral part of energy policy. The Government intends to bring all public sector buildings up to a reasonable standard of efficiency over the next 10 years, and to provide for a scheme of grants to allow householders to have basic insulation. The demand estimates allow for a reduction in total energy consumption by the end of the century of about 20 per cent below what it might otherwise have been, but many argue that with a vigorous and sustained national programme still greater savings could be achieved.

So far as the renewable resources are concerned, all are at present in the research phase only. A substantial and sustained effort will be required if these are to move into

development and demonstration. Research and development on wave power, solar energy, wind power, geothermal energy and tidal power at present amount to an expenditure in the UK of about £16 million over the next few years and is growing rapidly. But it is unlikely that annual energy supply in excess of 10 million tons of coal equivalent will be available before the end of the century. If nuclear power seems inevitable between now and then it is because the requisite work on alternatives was not begun 25 years ago. We shall have to work hard if some of these sources are to compete with nuclear energy 25 years from now.

There remains only controlled thermonuclear fusion whereby the light elements are combined as in the sun and the hydrogen bomb to release energy. The fuel for fusion is derived ultimately from sea water, the reserves of which are so large that if the process can be proved it may be seen to be the ultimate energy source. The prospects at present seem good; but even the optimists would agree that no substantial contribution to supplies is likely within 50 years.

Incidentally, these novel sources of energy are not as new as we sometimes make out. In 1899 John Perry, Professor of Mechanics and Mathematics at the Central Tech, which was later to become Imperial College, published a book called *Steam Engine* in which he wrote: 'For the last 20 years I have warned of the time when our stores of energy will be exhausted. By spending a few millions, nine-tenths of the energy in coal could be realised instead of one-tenth. When our store of coal is exhausted, the greater part of our civilisation will disappear. Then all places of high tide will become new centres of civilisation. Men will try to utilise stores of energy now thought to be insignificant – direct radiation from the sun, internal energy of the earth, wind power . . . There may be a new source of energy in a form unknown to engineers . . . If coal becomes more expensive, Lord Kelvin's idea of a reversed heat engine (ie, a heat pump) will find favour'. That was 79 years ago, but it sounds modern enough !

The Green Paper concludes then that as we move into the next century the world's available oil will need to be increasingly reserved for uses for which other fuels cannot readily be substituted, particularly for transport and petrochemicals. To some extent coal may be able to fill the gap caused by the withdrawal of oil from crude heat production, but coal itself may be needed as a raw material for the production of synthetic natural gas, of transport fuels and perhaps of petrochemicals, so that the amount available for electricity generation may actually decline. Fusion power and the renewable resources cannot yet be relied upon, however attractive they may appear, until the development has been done, and this will take 20 years or more. The only things we can rely upon in 1978 to fill the gap in the year 2000 are coal and nuclear power; but by that time, if we work hard and devote sufficient resources to their development, other choices may be available. The real energy crisis is not now; it is in the first quarter of the next century. We must prepare for it and we must be flexible.

As Lord Nathan put it in the Report to which I referred earlier: 'The present urgency to secure energy supplies must not lead to a crash programme leaving a trail of disaster in its wake. A policy for energy must evolve with new technology. Accordingly it is not only wrong but futile to envisage that a policy for the next 20 or 30 years or even longer can be created now, a blueprint which marks out in detail the policy for years to come. Nonetheless, technology does not evolve with such rapidity that a policy cannot be determined within the framework of a long-term plan'.

In particular, the strategy sketched out in the Green Paper has environmental implications which should be foreseen, just as we try to foresee the demand and supply options for energy, so that we may take them into account as we progressively determine our energy strategies.

Take coal, for instance. In order to raise annual output from 120 million tons to 170 million tons in the year 2000, the National Coal Board may need to open between 20 and 30 new deep and open-cast mines. Coal mining has been with us a long time, and many of the detrimental impacts of the past are still to be seen in spite of great efforts to reduce them recently. Mining affects large areas of land, although a modern underground colliery will use a surface area of less than 100 acres, comparable to a medium sized factory employing the same number of workers (a few thousand). There are also transport facilities, usually rail, which increase the disturbance to surrounding areas. With modern technology it is possible to control land subsidence in newer mines so as to lower the undermined landscape uniformly. Back filling can reduce the level of subsidence but only with a substantial increase in cost, and often there may be insufficient waste material available. The disposal of spoil on unsightly and sometimes dangerous slagheaps has been abandoned. New developments are carefully controlled by level tipping and progressive landscaping, and in some cases waste can be piped out to sea in the form of a slurry.

Direct pollution from modern coal mining is largely limited to the water used for washing out spoil. This is kept in ponds where the spoil rapidly settles and as far as possible the water is recycled. The most important source of pollution is water seepage from derelict mines which contaminates rivers and water sources

There are also socio-economic considerations. New mining operations affect patterns of employment in the surrounding area with implications for housing and transport. At present new mines tend to be located on the edge of developed coalfields so that the existing workforce may be able to commute from their homes. When new areas are opened up, however, it will be necessary to integrate the new work force with the existing population. The fact that the modern miner is a skilled worker whose pick and shovel have given way to sophisticated machinery may help here, especially since agricultural workers do not seem to be tempted underground.

The safety of miners continues to give concern, and is often cited as an argument for nuclear power as an alternative. However, although the hazards of underground mining still remain, accidents caused by methane explosions and roof-falls are becoming less frequent thanks to mechanisation and adequate air-conditioning. Haulage systems now represent the greatest hazards. The incidence of pneumoconiosis, too, is declining as a result of massive reduction in pit dust levels.

I will not give a similar catalogue of environmental factors affecting gas and oil. The main considerations are air pollution from petrochemical works and power stations, and the appalling hazards of oil pollution to sea and shore such as we saw in the *Torrey Canyon* episode and more recently in the Ekofisk blowout and *The Amoco Cadiz* disaster. Not only are beaches contaminated, but the effect on bird and marine life can be fatal. One should also take into account the pollution created by industry burning these fuels directly in manufacturing processes, and by motor vehicles, but I shall not do so today. It is fair to point out however, that the use of electricity by industry, although sometimes wasteful of primary fuels at least reduces the pollution produced at their works which are usually in closer proximity to human habitation than the power stations.

The production of electricity is the largest of the energy producing industries in the UK with assets in England and Wales of £6000 million and a turnover of £400 million a year. Although the land taken by power stations is not large in relation to other industrial plant, the enormous size of the structures make them a dominant feature in any landscape.

A modern fossil-fuelled power station producing 2000MW of electricity requires about 300,000 tons of cooling water per hour, much more than we can find in British rivers except in tidal estuaries. Cooling towers, however, in which the water is very largely recycled, take only about 3 per cent of the river water which would be required for direct cooling. One-third of the water is evaporated, the remaining two-thirds being returned highly oxygenated and purified, but more saline, leading to noticeable improvements in the river downstream. Moreover, not everyone would regard a cluster of cooling towers as a visual disamenity; in the right landscape they can add a majestic splendour !

Much more serious, as the Society knows, is the air pollution from the products of combustion in the boiler furnaces. Grit arrestors are used to remove the dust which causes smoke. But the flue gases also contain sulphur dioxide of which not much more than 90 per cent can readily be removed, and then only with the use of expensive washing equipment which reduces the efficiency of power generation. To scrub out all the sulphur dioxide from all our fossil-fuelled stations would increase primary fuel consumption by about 2 per cent – about the amount of energy that might be saved if every house in the country used solar panels to produce its domestic hot water ! Moreover, by cooling the flue gases scrubbing can cause more air pollution at ground level in atmospheric inversion conditions than it normally prevents, and it also creates a considerable water pollution problem.

In this country we have preferred to adopt very tall chimneys from which the flue gases are so greatly dissipated that only a very small concentration of sulphur dioxide will reach ground level nearby. Such chimneys add to the capital and energy costs of electricity generation. Growing concern, moreover, is nowadays being expressed about the effects of 'Acid Rain', namely rain in which sulphur dioxides have been dissolved, falling particularly in regions deficient in calcium and with acid soils. It is known that sulphur compounds released high into the atmosphere can travel long distances across seas and national frontiers. It is thought that a quarter of the sulphur dioxide deposited in Norway arises from the United Kingdom, with perhaps a similar amount from West Germany. Although knowledge of the effect of sulphur dioxide on crop yields and fish is at present limited, and although mineral weathering, agricultural practices and fallen leaves can cause more acidification than does precipitation, increasing attention to the pollution transported from the high stacks of the power and other industries is bound to be required, and it may prove costly to remedy.

Power stations burning coal also have to dispose of fly ash to the extent of 15 million tons a year in England and Wales. Some is used to make breeze blocks, most is used for fill. One can even grow grass on it, on which sheep may safely graze.

There is also growing concern about the climatic results of the continual global increase in the emission to atmosphere of carbon dioxide, the inevitable result of burning fossil fuels. A recent report by the US National Academy of Sciences has concluded that it may therefore be necessary to restrict the burning of these fuels within 20 or 30 years. Since the start of the industrial revolution the CO_2 content of the

atmosphere has increased by about 12 per cent. According to our present models of global climate, the next 40 years may see a rise of about 1°C in mean temperature arising from world forecasts of fossil fuel consumption. However, there are many complications not yet fully understood which could increase or decrease the resulting environmental effects. Moreover, the increased CO2 concentration may in part result from large scale deforestation seen in many parts of the world. What is certain is that we must do a lot more work on climatology and on macro-ecology during the next decade in case we have to make a gradual shift to non-fossil fuels in order to protect the global climate and prevent gradual melting of the polar ice caps during the next century. The time-scale for action, be it noted, is comparable with the introduction of new energy technologies: it is not so far off that we can afford to postpone serious investigation.

We have seen that it is necessary to suppose at the present time that there will be a rising contribution to our electricity supplies from nuclear power. The main features of the nuclear industry giving rise to public concern are the safety from radiation of those working in nuclear plants and in the surrounding areas, the possibility of a serious accident to a nuclear installation, the disposal of nuclear waste in such a way that it will not prove a threat to present or succeeding generations, and the fear that the growth of a nuclear industry throughout the world will lead to the proliferation of nuclear weapon capability amongst many countries. All these matters were reviewed in depth in the Sixth Report of the Royal Commission on Environmental pollution which was published in September 1976. Most of them were reviewed again by Mr. Justice Parker in his Report on the Windscale Inquiry published earlier this year. I do not want to go into all these controversial issues again today, even though they represent the most publicly debated aspects of energy policy.

I have described a few of the issues that will face the Commission on Energy and the Environment. In announcing the new Commission, the Secretary of State for the Environment said: 'The task of the new body will be to provide the Government with authoritative advice on the interaction of energy policies and the environment. The Commission will have a great diversity of interests. It will have to consider the environmental implications, nationally and globally, arising from the production and use in the United Kingdom of coal, oil, nuclear power, gas and electricity. It will need to examine the environmental side of renewable energy sources. It will be concerned with pollution. It will also be concerned with planning (although not with specific planning cases), examining the interface between energy policies on land use planning, and the implication of such policies for the natural world and the urban environment'.

This statement draws special attention to planning, and I would like to end by discussing this aspect of our task. Energy policy deals with questions of supply and demand on a national, if not global scale. By contrast, local circumstances are usually the most important factors in planning. There are few absolute constraints on environmental and planning policy. To be sure, if it proved impossible safely to dispose of nuclear waste, or if it were shown that increasing levels of atmospheric CO2 were harmful, these findings would place a limit on the exploitation of nuclear or of fossil fuels. Generally, however, the assessment of the environmental effects of energy production and use involves balancing a range of considerations that will differ from place to place. Only when energy policy is worked out in some detail, when sites and routes can be identified at least in principle, can the scale and quality of the environmental impact be assessed.

Even in individual cases planning controls are designed to be flexible. The broad objectives are to safeguard health, to conserve and improve as far as possible the physical surroundings that people value, and to meet the needs of housing, employment and recreation so as to provide an acceptable working and living environment. Of course, part of the job is to provide sufficient energy in the right form ! But only those objectives which safeguard health can generate, where the evidence exists, fairly rigid controls. Even here the risks can usually be reduced at a cost, so that it becomes a matter of judgement how much it is prudent and practicable to spend in given circumstances. There are also inherent conflicts between them. Development and change conflict with conservation. Much of the practical work in planning is concerned with reconciling these conflicts and deciding on compromises which the flexibility of planning and environmental controls is designed to assist.

Applications for planning consent are thus considered singly, case by case, whether it is the Windscale plant or the Archway Road. There has to be an opportunity for factors affecting the choice of individual sites to be argued out against a detailed proposal. But it is perhaps for consideration whether in view of the sheer scale of development of new coal mines and power stations, and perhaps in the future of some of the renewable sources of energy, whether more work should not be done of a conceptual kind at the strategic level.

An example of strategic planning made necessary by the pressures to develop North Sea oil is provided by the policy guidelines published by the Scottish Office. These set out preferred zones for conservation and for development along the Scottish coasts. Guidelines of this nature do not constitute a plan, nor do they prejudice the decisions of the planning authorities or the Secretary of State on individual cases. Case by case consideration will always be necessary; but it can be argued that the sheer unpredictability of sporadic local hearings could encourage an overall development that is logistically and environmentally unsatisfactory. There is also the danger that it will become increasingly difficult to win public co-operation and acceptance unless people can see how individual proposals fit into the total picture.

It is then in this total context of imperfectly predicted energy demand, uncertain contributions from the different sources of supply, local and global environmental consequences of different energy strategies, and the planning framework within which we all have to work, that the Commission on Energy and the Environment has decided that its first major study shall be concerned with the implications of coal production in the long term future, and of the use of coal including its conversion to other fuels and feedstocks. I am glad to say that the National Coal Board has agreed to participate fully in this study.'

I will end as I began with a quotation from Lord Nathan's splendid report. After reviewing, as I have done, some of the environmental implications of energy policies he said: 'They should be considered in the evolution of energy policy and not as an afterthought. If energy policy is determined without regard to them it will be confronted, as it has been, by a public outcry led by an environmental lobby. To choose the best policy and to implement it the Government, Parliament and the public must be informed of the options that are open and the consequences of adopting each.' The Standing Commission on Energy and the Environment will do its best to let Lord Nathan have his way. By all appearances it will keep us damnably busy.

NEWS FROM THE DIVISIONS

NORTHERN DIVISION

Fifty-one members of the Northern Division attended a meeting held on 7th March, 1979 at Gateshead Town Hall. After the normal Divisional business, the members enjoyed an interesting and informative presentation by Mr. G. W. Robinson and Mr. D. L. Newman, the Divisional Manager and Field Sales Manager respectively of Phillips Petroleum Products Ltd.

Mr. Robinson commenced by briefly tracing the history of the oil industry from early biblical times up to date. He displayed photographs and pictures together with samples of oil and rock from under the North Sea and described the differences between the crude oil found in various parts of the world before introducing the film *The Ekofisk Story.*

The film told of the co-operation between the Norwegian Government and the Phillips Company which led to the drilling of the wells in the Ekofisk field and the eventual discovery of oil and gas after numerous failures. The 'blow out' at Ekofisk which received so much publicity at the time was shown and gave some idea of the appalling conditions that Red Adair and his team had to work under in order to stop the 'blow out' and bring matters under control. Currently oil is being pumped ashore at Teesport while gas is piped under the sea to Emden in Germany, and the efforts being made by the company to minimise any possible detrimental effects to the environment, both out in the North Sea and when the products are brought ashore, were rightly given prominence.

Mr. Newman completed the presentation by a short talk on the current situation in the oil industry with particular reference to the possible effects of the recent internal problem in Iran.

The presentation was very well received by members who asked numerous questions of the two speakers who were thanked at the close by Mr. J. Taylor, Chief Environmental Health Officer, Castle Morpeth DC.

C. R. Cresswell,
Hon. Secretary

NORTH WEST DIVISION

The policy of the North West Divisional Council to involve the membership of the Division was continued on Thursday, February 8th, 1979 when some 60 to 70 members visited the Heysham Nuclear Power Station, which is at the present time under construction.

The visit was organised to perfection by the Central Electricity Generating Board. Members met on reception and provided with a very welcome cup of coffee, while the day was clear, it was rather cold.

The intricate workings of a Nuclear Power Plant were explained by Mr. Matthews of the Central Electricity Generating Board's staff, and members were given the opportunity of asking questions which were ably answered by Mr. Matthews.

The new plant was inspected by members and it was obvious that all were impressed by what they had seen by the numbers and quality of the questions which emerged at the question and answer session which followed. There is no doubt that visits of this nature keep the membership involved during the present 'go slow period' in Clean Air progress.

W. E. Pollitt
Hon. Secretary

NATIONAL SOCIETY FOR CLEAN AIR

Notice of the 1979 Annual General Meeting

The AGM will be held on **Thursday, July 19th, 1979,** at Imperial College, (Room 213, Huxley Building, 180 Queens Gate, London SW7). Proceedings will commence at **11.30 a.m.** Attendance is restricted to members of the Society and their representatives. The business meeting will incorporate the Induction of the new President of the Society.

A meeting of the newly-elected Council of the Society will be held in the afternoon, also at Imperial College.

HSE plan to extend control over industrial air pollution and noise

Later this year, the Health and Safety Executive will be issuing a Consultative Document containing a revised list of scheduled processes. The Alkali Inspectorate has been working on this list for some time, and it is expected that some major changes will be proposed.

HSE is also paying increased attention to noise, and will issue draft regulations controlling noise at work later in the year. Most controls will be aimed at reducing noise at source wherever possible.

Mr. Bill Simpson, Chairman of the Health and Safety Commission, addressing an audience of industrial safety officers, discussed workplace health and safety into the 80s. He emphasised that health and safety must begin with preparation, training and planning, and explained that the Commission's own policy to help stimulate prevention acknowledged the prime importance of better information. He said that another important concern of the Commission stems from the provisions of the Act which place a duty on employers to have a care for the risks to the health and safety of the public at large from work activities. He explained that such reports by the Executive as that on the hazards of Canvey Island had provided new technical bases for analysing risks to the public, so that planning authorities could take sensible decisions. 'I do not see serious new problems here for industry' said Mr. Simpson. 'Industry is already part of our environment as well as the basis of our prosperity. The Health and Safety Commission's interest in its effect on the public as well as the workforce can help industry to become more fully integrated into the community of which it is already a part.'

That sounds reassuring – for industry. In the meantime, the Chief Alkali and Clean Air Inspector's report for 1977 is expected to be published within the next couple of months. We hope that this report will give equal reassurance – to the public.

CONCENTRATIONS OF SOME AIRBORNE POLLUTANTS AT VARIOUS SITES IN LONDON

Measured and compiled by the Air Pollution Section, Environmental Sciences Group, Scientific Branch, Greater London Council

The data presented in Table 1 is the current three-month summary of the results obtained at County Hall, London SE1.

Table 1

Results for July-Sept. 1978	Roof-top site			Road-side site		
	July	Aug.	Sept.	July	Aug.	Sept.
CO (ppm)						
24 hr. average						
minimum	1.1	1.1	0.8	1.5	2.0	1.7
mean	1.8	2.0	1.9	4.5	4.4	5.0(b)
maximum	2.8	3.1	3.4	7.1	7.4	7.4
NOx (pphm)						
24 hr. average						
minimum	1.8	1.5	1.1	5.7	5.9	3.5
mean	2.8	3.0	3.4	12.1	12.3	11.9(b)
maximum	5.8	5.4	8.2	21.9	18.6	21.7
SO2 ($\mu g/m^3$)						
24 hr. average						
minimum	30	19	11	–	–	–
mean	78	56	63	–	–	–
maximum	235	130	200	–	–	–
tsp ($\mu g/m^3$)						
monthly average	36	33	38	53	51	56

(a) 23 days only
(b) 21 days only

Notes

1. The sampling point for the roof-top measurements is about 30m above ground level.
2. The sampling point for the road-side measurements is about 10m horizontally from the edge of a major roadway and about 6m above pavement level.
3. The CO measurements are made with an Ecolyser (Energetics Science Inc.).
4. The NOx measurements are made with a chemiluminescent gas analyser Model 14D (Thermo Electron Corporation).
5. The SO2 measurements are made with a Philips SO2 Monitor type PW 9755; they are made only at the roof-top site.
6. The concentration of particulate matter is measured gravimetrically on a weekly basis.

INTERNATIONAL NEWS

ITALY
Air Pollution is a Major Cause of Deterioration of Roman Monuments

Air pollution and traffic vibration have damaged many of Rome's ancient monuments so badly that access to them will have to be restricted if they are to be saved, the Supervisor of Antiquities has warned. He said, 'The problem is as serious as that of the Acropolis in Athens, but on a much larger scale, because it involves the whole city.' In the past 25 years, Rome's population has doubled and traffic has become extremely congested in the centre of the city, where the famous arches, columns, and temples are located. Over the years, exhaust fumes have settled on the structures, the rain has turned them to acids, and they have eaten away the features of the monuments. Tourists tend to dismiss the sorry appearance of the monuments due to their great age. Italian archaeologists say, however, that 'tests demonstrate without a doubt that within a few decades, due to air pollution and traffic vibration, we will lose all the basic documentation of the history of Roman art.'

(Rome Daily American – 23rd December, 1978)

USA – New EPA Report Documents Decline of Air Visibility in North East

Visibility in the North East of the United States has declined significantly during the past 25 years, according to a new report by the US Environmental Protection Agency's Environmental Sciences Research Laboratory.

Although metropolitan areas showed very slight decline in visibility (approximately 5 per cent from 1953 to 1972), urban/suburban and non-urban locations underwent visibility declines of 10 to 40 per cent during the same period.

This degradation is receiving close scrutiny by environmental scientists because of its adverse ecological effects.

Presented in the report are summaries of data collected from 10 airport weather stations in seven states and the District of Columbia. These are divided into three major categories: metropolitan, urban-suburban, and non-urban.

At six of the 10 airports studied, it was possible to link data from the National Air Surveillance Network with the airport visibility data in order to study the visibility-pollutant relationships.

The EPA believe that they will be valuable to scientists involved in atmospheric and health effects research. There has been speculation, partially supported by theory and data, that haze levels may play a sigificant role in climate modification.

Analyses indicate that visibility reduction is closely related to atmospheric sulphate concentrations. If this is true, sulphate is the major cause of visibility-reducing haze, the haze is linked to other sulphate-related problems, and visibility measurements can be used in the North East as an indication of sulphate concentrations in instances where sulphate measurements are not available.

Copies of the new report are available in limited quantity through the Public Awareness Director, Environmental Research Center. Research Triangle Park, North Carolina 27711 (EPA Report Number 600/3-78-075: *Visibility in the North East – Long-Term Visibility Trends and Visibility/Pollutant Relationships*).

BOOK REVIEWS

The Measurement of Airborne Particles.
Richard D. Cadle. Wiley-Interscience, 1976. 342 pages. £13.85.

This book is concerned with the size, shape, nature and number of particles present in static and dynamic air systems. Past and present methods of particle assessment are discussed in detail and are supported by excellent diagrams and photographs. The design and presentation of the book generally is in keeping with the high quality of the content, but there are occasions when the reading flow is interrupted by references to diagrams away from the page on which the references appear.

Dr. Cadle has brought together such a mass of information that a single-subject specialist can scarcely do justice to the different disciplines covered; but one point that is made clearly is that the validity of particle counting by automatic means is still being questioned. The advocates of automatic particle counters argue that counting by eye is tedious and therefore inaccurate. Microscopists on the other hand argue that the artificial test particles such as polystyrene or latex spheres used for correlation purposes in the automatic mode do not behave in the same way as terrestrial particles when traversing the counting cells of light blocking or light scattering instruments.

The writing style is curiously inconsistent. The information given in the section on sedimentation theory seems over-complicated compared with the section on applications which I found intriguing and easy to understand. There are excellent descriptions of transmission and scanning electron microscopes, together with useful information on the subject of sample preparation for all forms of analysis. Such comprehensive cover is rare. The section on measurement includes well-written observations on achromatic condensers in photomicrography and concise statements on the problems associated with dark field illumination and on light intensity control in general. Dispersion staining is also carefully discussed. However I am surprised by Dr. Cadle's suggestion that a box camera could be used in photomicrography; and also by his comment that use of 35mm film involves wastage. In my experience it is normal practice to load into a cassette only sufficient film for current purposes.

Apart from such minor adverse criticism I find the book very readable, providing a comprehensive review of methods of capturing, measuring, counting and identifying particles from air in varying conditions. The well designed layout mentioned earlier facilitates quick access to much useful information.

Alan Goldsmith

Water Pollution. Proceedings of the Eighth International Conference, Sydney, Australia 1976.
Editor S. H. Jenkins, Severn-Trent Water Authority. Pergamon Press, August 1978. 1,060 pages. £60.00 ($120.00).

This volume contains the main conference papers (75), discussions (113) and replies, and workshop papers (43) together with an author index and a full subject index. The papers, by the world's leading scientists and engineers specialising in water resources conservation, deal with inland coastal and estuarial waters. The book will be of interest

to pollution control authorities and governmental bodies, industrial organisations and scientists and engineers specialising in water resources conservation. It will also be a useful source of reference for researchers.

Sulphur in the Atmosphere. Proceedings of the International Symposium held at Dubrovnik, Yugoslavia 7th-14th September, 1977.
Edited by R. B. Husar, J. P. Lodge and D. J. Moore. Pergamon Press. July 1978. 804 pages. £15.00, $30.00.

This book is a specially bound hardback issue of the journal *Atmospheric Environment,* Vol. 12, Nos. 1-3.

The 77 papers presented cover the major aspects of sulphur transport, transformation and deposition, excluding emission control and near field dispersion modelling. The conference which was sponsored by UNEP, USEPA and USEPRI, attracted contributions from most of the leading workers in the field. This book, which includes the papers and the summaries of the workshop session reports, provide an excellent and up-to-date state of the art survey.

The long-range transport of air pollution is well covered, with several papers specifically on the OECD study. Among other subjects are water-soluble sulphur compounds in aerosols; sampling and analysis of atmospheric sulphates and related species; budgets and distribution of sulphur compounds; physical properties and characteristics of sulphur aerosols and compound. Specific methods of monitoring discussed include a quantitative method for the detection of individual submicrometer size sulphate particles; continuous *in situ* monitoring of ambient particulate sulphur using flame photometry and thermal analysis; and a new detector for sulphuric acid aerosols, the aerosol mobility chromatograph.

The book will undoubtedly attract a wide readership, as it contains material of interest to workers in meteorology, analytical chemistry, environmental chemistry and physics, as well as those engaged on atmospheric chemistry and air pollution studies generally.

NEW ADDITIONS TO THE NSCA LIBRARY

Advisory Council on Energy Conservation. Energy paper No. 31. 28pp, HMSO. '78. £1.75.

Air Quality in Selected Urban Areas. 1975/76. WHO 1978. 42pp. SwFr.9.

Analysis of the Measuring and Testing Procedures for Motor Vehicle Exhaust Emissions. Regulated in Europe and USA. Volkswagen 1978. 162pp.

Carbon Dioxide and the 'Greenhouse Effect' - an unresolved problem. IEA Coal Research. April 1978. 40pp. International Energy Agency.

The Combustion of Coal in Fluidised Beds. G. Thurlow. Inst. Mech. Engs. Proc. 1978. Vol. 192. No. 15. 12pp. £1.

Economies of Scale in Electricity Generation and Transmission since 1945. Sir Francis Tombs. 43rd Charles Parsons Memorial lecture. Inst. Mech. Eng. Proc. 1978, Vol. 192. No. 39. 9pp. £1.

Energy and the Environment. M. Barriere. 64th Thomas Hawksley lecture. Inst. Mech. Eng. Proc. 1978. Vol. 192. No. 18. 15pp. £1.

Sampling Gasborne Solids. Some factors affecting the characteristics of miniature cyclones. R. F. Littlejohn. B. Smith. Inst. Mech. Eng. Proc. 1978, Vol. 192. 8pp. £1.

The Control of Pollution Act Explained. R. MacRory. B. Zaba. Friends of the Earth. 1978. 87pp. £1.50.

Digest of Environmental Pollution Statistics. D.o.E. 93pp. HMSO 1978. £3.25.

Manpower Requirements of the Energy Industry. Energy Commission Paper No. 18. Dept. of Employment. 57pp. HMSO 1978.

The Pattern of Domestic Energy Consumption and the Growth of Prices in Relation to Consumers' Income and Expenditure 1966-1977. Energy Commission Paper No. 21. Sir F. Tombs. Electricity Council 6pp.

Transcript of Proceedings. 4th Meeting December 1978. Energy Commission Paper. No. 18. 37pp. D.o.E.

UK Oil and Natural Gas Depletion. Energy Commission Paper No. 20. Electricity Council, Gas Consumer Council, Dom. Coal Consumer Council. 4pp. D.o.E.

The European Oil Industry and the Environmental Report. No. 8/78. 23pp. Concawe.

Hydrocarbon Emissions from Gasoline Storage and Distribution Systems. Report 4/78. 123pp. Concawe.

Method for Determining the sound - power levels of air-cooled (air-fin) heat exchangers. Report No. 5/78. 27pp. Concawe.

Fate of Pollutants in the Air and Water Environment. Part I. Ed. I. H. Suffet. Vol. 8. Advances in Environmental Science and Technology. 484pp. Wiley Interscience. 1977. £18.70.

Intra-Urban Mortality and Air Quality: An Economic Analysis of the Costs of Pollution Induced Mortality. 85pp. USEPA. July 1977.

Law and Practice Relating to Pollution Control in France. C. A. Colliand for Environmental Research Ltd. 190pp. Grayham and Trotman 1976. £7.50 + 50p p and p. Plus updating supplement. 12pp. 1978.

Ibid. The Law and Practice Relating to Pollution Control in the F.R. Germany. H. Steiger, O. Kimminice. 420pp. G & T. 1976. £7.50 + 50p. p and p. Plus Supplement 12pp. 1978.

Ibid. The Law and Practice Relating to Pollution Control in the Member States of the European Communities. A Comparative Survey. J. McLoughlin. 546pp. G & T. 1976. £7.50 + 50p. p and p. Plus Supplement. 52pp. 1978.

Limitation des Emissions de Pollutants et Qualite de l'Air. Valeurs Reglementaires dans les Principaux Pays Industrialises. 1978. P. Jarrault. Inst. Francais de l'Energie. 142pp. 159F.

Noise Implications of the Transfer of Freight from Road to Rail. Noise Advisory Council. 15pp. HMSO 60p.

Nuclear Power: Issues and Choices. Report of the Nuclear Energy Policy Study Group. 415pp. Wiley 1977. £11.

The Protection Handbook of Industrial Noise Control. 2nd Ed. P. Sutton. 40pp. Alan Osborne Assoc. £1.50.

Sulphur in the Atmosphere. Proceedings of Int. Symposium. Dubrovnik 1977. Ed. R. B. Husar, *et al.* 816 pp. Pergamon 1978. $30.

Water Pollution Research. Proceedings of 8th Int. Conf. Sydney 1976. Ed. H. Jenkins. 1,060pp. Pergamon £60.

SMOKE CONTROL ORDERS

The list of new smoke control orders for the period 31st December 1978-31st March, 1979 will appear in *Clean Air* Vol. 9, No. 3, to be issued at the end of June, 1979.

INDUSTRIAL NEWS

Ammonia Incinerator Meets Most Stringent Pollution Control Regulations

During recent years, various government and local authority bodies involved in controlling environmental pollution, have begun to place increasing pressure on the chemical industry to reduce both atmospheric pollution and energy waste.

A by-product of diphenylamine manufacture, at the Huddersfield works of Imperial Chemical Industries, is a waste gas stream containing ammonia. Previously, the ammonia was partially removed in a water absorption system, some residual gas being vented to atmosphere. The company had been requested by the Alkali Inspectorate to find ways of reducing the ammonia emissions.

The chosen solution to the problem was a vortex incinerator supplied and installed by Peabody Holmes to handle up to 246lb/hour of ammonia waste gas. The plant has now been successfully commissioned and produces atmospheric emissions cleaner than those required by the most stringent pollution regulations.

The efficiency of the plant is so high that only a minimal amount of support fuel is required to maintain the operation of the incinerator.

Reader Enquiry Service No. **7915**

BACC Provide Nuclear Safety Equipment

At the Dounreay Nuclear Establishment, electrostatic air cleaning equipment manufactured by BACC (Engineering) Limited, of Dover, is providing an additional line of defence in the UKAEA's stringent safety precautions.

A specially modified unit, based on BACC's Clift range of electrostatic air filtration equipment, is installed to prevent the escape of contaminated particles into the atmosphere in the unlikely event of a fire in a contaminated matter silo. The silo contains a nitrogen atmosphere under negative pressure: a fan draws the gases through an exhaust system to two parallel absolute filters, which extract any particles before discharging to atmosphere. However, should a fire break out in the silo, the absolute filters would be at risk: any sparks or burning matter in the gas flow might burn through the cloth filters and present a hazard.

To deal with this eventuality, the BACC unit has been installed in parallel with the absolute filters,isolated by diverter valves wich are actuated by high temperatures or smoke in the silo. Thus should a fire break out, the gases are drawn through a cooling water jacket and then fed automatically through the BACC filtration unit. The gases pass initially through an ionising cell, consisting of wires supplied with a high voltage positive current, which positively charge any airborne particles. The flow then passes through a double bank of electrostatic filters, in which alternatively positively and negatively charged metal plates attract and retain the particles with an efficiency better than 99 per cent. The cleaned gases are then discharged to atmosphere.

This still leaves the problem of how to dispose of the now contaminated filter bank of the unit. This modified unit has been specially designed so that the filter

bank can be replaced with a fresh unit with no possibility of escape of polluted particles.

The filter bank is a plug-in module, enabling it to be pulled straight from the unit after simple retaining clamps have been disconnected. Access is via a mild steel spigot, to which are clamped the mouths of two collection bags, one contained within the other, with the longer outer bag already holding a clean filter. The contaminated filter is pulled into the inner bag, which is then unclamped from the spigot, and moved to the bottom of the outer bag. This allows the clean filter to be pushed in to replace it. Two heat seal joints are now made in the bottom of the outer bag, and the section containing the securely sealed contaminated filter is cut away to be placed back in the silo.

This installation illustrates BACC's ability to provide a solution to specialised airborne particle collection problems. Standard Clift four-stage electrostatic filtration units can deal with most dust and fume problems, but special units have been designed and manufactured to handle more difficult duties, such as the collection of airborne asbestos particles.

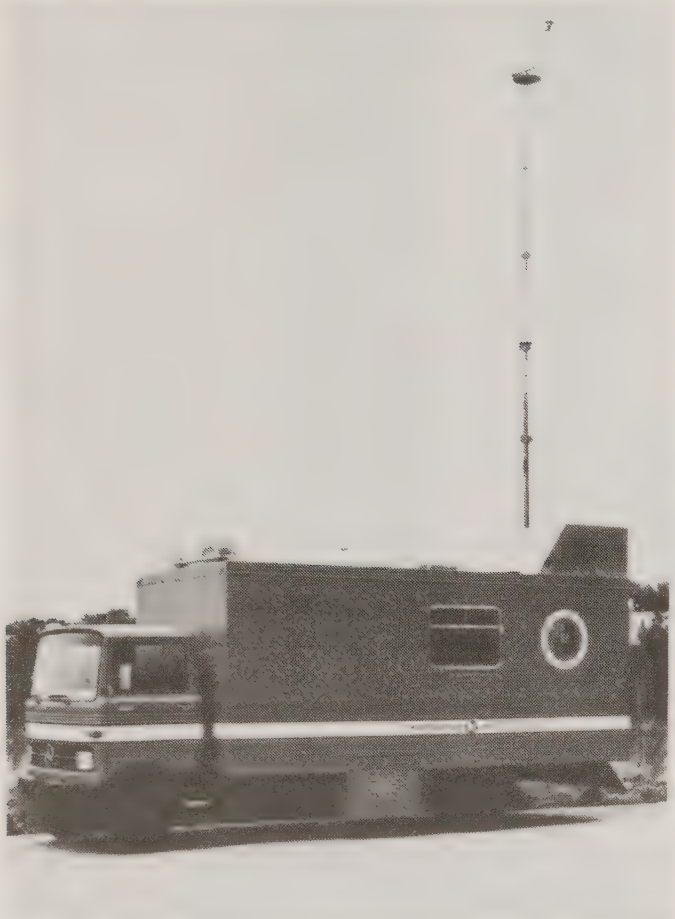
Reader Enquiry Service No. **7916**

Mobile Laboratory Acts as Pollution Watchdog

The enforcement of air pollution laws by the relevant authorities, and the study of the quality of air which surrounds their plants by socially conscious processing companies are now readily and economically possible by the use of the Aerotest air pollution monitoring van, available from Krohne Measurement & Control Ltd, Galowhill Road, Brackmills, Northampton.

Basically the Aerotest is a complete laboratory on wheels, in which instruments for the sampling and analysis of air for all the major pollutants and for the simultaneous measurement of ambient meteorological data are housed in a special van body designed to suit the

physical requirements of the commercial vehicle chassis specified by the purchaser.



Aerotest monitoring vans can be employed at measuring points not covered by fixed measuring stations and about which more information is required; for tracing the source of air pollution; for assessing the pollution from new, or extensions to existing, industrial plants; at major emergencies and accidents – for measuring the spread of toxic concentrations and warning the population; to take reference measurements for existing measuring systems; and for special measuring programmes.

Reader Enquiry Service No. **7918**

Long-Established Lighthouse Refurbished

The Electronic Lighthouse is Castle Associates Deluxe Model Sound Level Switch, designed for the control of excessive sound levels in places of entertainment. Since it was first introduced over five years ago it has been installed in many clubs and discos to provide a relatively inexpensive means of control in addition to an entertaining, multiple level light display. Clear indication is also provided when the equipment has cut off power.

Although it already has electrical safety approval from authorities in Sweden and Canada, two recent developments add to the safety of the equipment and provide additional user benefits. Firstly an earth-leakage trip option is introduced to further extend the degree of electrical safety. Secondly, a management override key switch is introduced as a standard feature, so that the switch mechanism may be bypassed, enabling management to leave power connected to amplifiers whilst not affecting the display.

As manufacturers of precision sound measuring equipment with a fully international outlook, Castle Associates are anxious to maintain the reputation of their products as the safest, most reliable on the market. The Electronic Lighthouse is the 'Top of the Range' model in the entertainment industry, providing a safe, comprehensive, clever and attractive unit to control the level of sound in a hall and hence eliminate complaints of noise disturbance from neighbours.

Reader Enquiry Service No. **7919**

Today's Refuse Tomorrow's Energy

Heenan Environmental Systems Limited, a Redman Heenan Group Company, has supplied a Rotary Drum Screen to the Madison Solid Waste Fuel Company Inc. of Hinsdale, Illinois, USA.

The Rotary Drum Screen, which is capable of processing 40 tons of municipal refuse per hour, forms part of a processing plant producing transportable waste derived fuel.

The waste derived fuel will be used as a supplementary fuel on a local steam generating plant, thus reducing the quantity of coal being fired in the boilers and minimising landfill requirements.

While the screening technology was developed on the Heenan Incineration plants, these screens are now finding wider applications on other forms of waste processing.

Reader Enquiry Service No. **7920**

Remote Sensing of SO2 or NO2

An instrument said to provide atmospheric pollution data unobtainable by any other means is now available from Barringer Research of Toronto, Ontario, Canada. Designated Cospec IV, the instrument is a correlation spectrometer designed to make remote measurements of the SO2 or NO2 content in the air.

Developed as a new and improved version of the Cospec II, the instrument is unique in that it quantitatively measures overhead burdens of SO2 or NO2 gas, in grams per square metre. Plume analysis can be made based on direct measurement of the plume parameters, and plume models can be verified.

Mobile installations on the ground or in the air permit real-time measurements of specific sources of air pollution or, alternatively, of air pollution on a regional scale.

The instrument requires little skill to operate. It is not purely a research device but is also intended for basic, routine air-pollution measurements and analysis from the ground or above.

Cospecs are used in many countries around the world by governmental, national and state environmental protection agencies; monitoring and regulating agencies; meteorological units and weather bureaux; atmospheric research institutes and universities; environmental service contractors and consultants.

Industrial users include petroleum companies, mining companies, large, heavy-manufacturing firms and electric power utilities.

Reader Enquiry Service No. **7923**

New Amorphous Material Suitable for Efficient Solar Cells

Utilising a new amorphous material developed by Energy Conversion Devices Incorporated and described in the 30th November editions of *Nature* and *New Scientist,* solar cells, competitive with fossil and nuclear fuels could well be developed and produced

Based upon problems associated with previous photovoltaic materials, the US Department of Energy and American Industry sources have consistently held that direct conversion of solar energy into electricity by photovoltaic cells could not be competitive until 1986 or even 2000. Ovshinsky said that given proper priority, solar cells utilising the new amorphous material could be competitive well before that. The ECD material is a new alloy whose main structural components are amorphous silicon and fluorine. The material is multi-elemental, includes hydrogen and can also include other elements, such as oxygen, without deleterious effect.

The letter in *Nature,* written by Ovshinsky and Arun Madan of ECD, states that the material has proven to be 'superior to Silane-based film for electronic applications. In particular, there is a much lower density of space at the Fermi level. This leads to much larger doping efficiencies, in fact, effective n-type doping has been achieved. Furthermore, no photostructural effects (in parts per million) have been observed. Because of its highly desirable characteristics, this material appears to have potential for general semiconducting applications as well as for photovoltaics.'

The superiority of the ECD alloy is known as the result of data taken from more than 600 sample depositions of the material performed in the ECD laboratories, Ovshinsky said.

These experiments show, given the proper developmental steps, photovoltaic cells in the form of wide area thin films can be commercially manufactured and can compete with fossil and nuclear fuels in the early 1980s.

Reader Enquiry Service No. **7924**

CLEAN AIR

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EIGHTY YEARS

This year the Society celebrates its 80th birthday. But this is not a time for looking back, although the Society can indeed look back with a sense of achievement; rather it is a time for looking forward and examining what still remains to be done.

As for achieving cleaner air, there has indeed been considerable progress. Although it took a long time for the Clean Air Act to reach the Statute Book and it has taken some local authorities a long time to realise the benefits of smoke control and clean air, progress has not only been made, but it continues to be made. Nevertheless, there are still some authorities which have not yet started a smoke control programme and there are others where progress is woefully slow. So the Society's task of stimulating interest and progress in smoke control still remains, albeit in a somewhat reduced form. To a certain extent, we are preaching to the converted; the argument is that progress is slow because money is not available.

However, as has been said often before, as the smoke has abated, so other pollutants have become not only more noticeable but more objectionable. But there has been progress on this front too; and although the task is by no means completed and although there is no doubt whatsoever that fresh problems will continue to arise, much has been achieved in the last 80 years and more particularly in the last quarter of a century.

So what lies ahead? Obviously, efforts cannot be relaxed on the clean air front. Although smoke control is now an accepted way of life, bituminous coal is still being sold and used in smoke control areas. There are still problems with smoke from diesel vehicles and exhaust fumes from motor cars. There are still problems caused by industrial processes. Nevertheless improvement is being made and so long as society as a whole is vigilant, progress will continue. Here the Society still has a duty to perform: it is still the watchdog over clean air.

More recently the Society widened its terms of reference to include other forms of pollution as they affected or were affected by air pollution. Noise is one of these forms of pollution, and increasingly over the last few years, the Society has become concerned with noise abatement. After 80 years of cleaning the air, perhaps the time has now come when the Society should impart a distinct shift of emphasis to its activities, concern itself more with noise abatement, and restructure its activities accordingly. This is not a change of direction but rather a change of emphasis, a change of emphasis which will give the Society new life and keep it abreast of modern developments at a time when its own management is changing and when it is appointing a new Secretary General to look after its future. Such a change will enable the Society to widen even further its terms of reference and as a result, to increase its membership. If the Society is to continue, it must continue to be active, it must continue to expand. If it stands still it will die.

WORKSHOP ON POLLUTION FROM ROAD VEHICLES

University of Warwick, 9-11th April, 1979

The subject of the 1979 NSCA Workshop proved to be very popular and it attracted a large audience with many delegates from the motor manufacturing industry. Summaries of the papers presented at the Workshop are published in this edition of *Clean Air* under 'Pollution Abstracts'. The Workshop was arranged so that there was ample time for discussion at each session and delegates took full advantage of this. The final session was a general discussion period with a panel of speakers fielding questions from the floor. The Workshop also included a talk by Derek Shave of Warwick University, Engineering Science Department, on the Working of the Internal Combustion Engine. He explained that experimental work on the stratified charge engine was proceeding very well and that this type of engine offered great hope for improvement in emission controls and fuel economy in the future. Delegates were given the opportunity to visit the Engineering Science Department of the University during the Workshop and see for themselves the progress that was being made. Two other optional visits were arranged for the afternoon of the last day of the Workshop. Most of the delegates decided to take the opportunity to visit either British Leyland's Atmospheric Pollution Control Research Laboratory at Coventry, or MIRA at Nuneaton. Both groups found the visits interesting and very instructive. There were many questions from the delegates and the staff at both British Leyland and MIRA were most helpful.

The opinion expressed by several delegates at the Workshop was that emission controls were proceeding at a satisfactory rate in the UK, and that it was very important to be aware of the need for energy conservation. Many proposals for further emission control would involve a penalty in terms of energy consumption and the benefits of proposed emission controls would therefore have to be assessed very carefully. However, the second session on the Health Effects of Pollutants from Motor Vehicles produced a note of caution from several delegates.

There was concern first of all that health effects of the various pollutants should be properly evaluated and secondly that any future emissions standards should be based on properly established environmental health criteria.

Those wishing to study the full text of the papers and reports of discussions may obtain the Workshop Proceedings from the National Society for Clean Air, at a price of £5.75 (incl. post and packing).

POLLUTION ABSTRACTS

Papers presented at the NSCA Workshop on Pollution from Road Vehicles, Warwick University, April 9-11, 1979

'The Relative Importance of Motor Vehicles as a Source of Some of the More Common Atmospheric Pollutants' *by Dr. A. W. C. Keddie, Warren Spring Laboratory.*

It is now generally accepted that motor vehicles are an important source of atmospheric pollution, especially in urban areas. This paper gives a brief account of what is known about UK emissions of the more common pollutants from stationary sources and motor vehicles and about the relative contribution of motor vehicles to ground level concentration of these pollutants, namely sulphur dioxide (SO2), particulates (smoke),

lead (Pb), carbon monoxide (CO), oxides of nitrogen (NOx) and hydrocarbons (THC's). No attempt is made to break down the total hydrocarbon figures by species although it is fully recognised that the more reactive species are the most significant in respect of potential effects and role in the atmospheric chemistry. Ozone (O3) is not emitted to any significant extent by men's activities but is generated as a secondary pollutant when strong sunlight interacts with NOx and hydrocarbons. Some reference is made to ground level concentrations of ozone. Among his conclusions, the author points out that as well as being the major source of CO and Pb emissions to air in the UK, motor vehicle exhausts are a significant source of smoke: about 10-15 per cent on a mass basis, and perhaps 20-25 per cent if the greater blackness of diesel smoke is taken into account.

'Emissions from Internal Combustion Engines: Pollutants and their Diversity'
J. H. Boddy, Mobil Oil Company Limited

The paper attempts to show the diversity of substances which might be emitted from internal combustion engines. The author explains that if a pollutant is defined as 'any substance which in some concentration could have an adverse effect on human beings,' there is no end to the number of emittents which might have to be identified, measured and controlled. He shows that pollutants derive from the composition of the fuel and any fuel additives, the components of air, and the reactions taking place in the combustion chamber. The origin, occurrence, and amount of pollutants are discussed in relation to two anchor points of concern: photochemical smog, principally of interest to the USA; and carbon monoxide in city streets, the principal European concern. Carbon monoxide (CO), hydrocarbons (HC's) and nitrogen oxide (NOx) are the conventional automative pollutants controlled throughout the world. The other pollutants examined in detail are aldehydes; sulphur oxides, primarily SO2 occurring in exhaust from diesel engines; and particulates, including lead. The emissions from spark ignition engines and diesel engines are assessed separately and tabulated. The author points out that although there are a multitude of emittents from motor vehicle engines which have a potential for detrimental effect, the physical form and concentration of the substance are significant factors in relation to the actual effect in terms of human health.

'The TRRL Quiet Heavy Vehicle Project' *J. W. Tyler, Transport and Road Research Laboratory*

The Quiet Heavy Vehicle (QHV) project was begun in 1971 with the aim of showing that heavy diesel-engined articulated vehicles could be quietened by some 10 dB(A). The other objective was to indicate the cost of this reduction in noise level. The QHV Project was managed and co-ordinated by TRRL in co-operation with the other participating organisations. The two vehicles selected for research purposes were a Leyland 32 ton lorry and a Foden Rolls-Royce tractor unit. For both vehicles the objective was to achieve a target level of emitted sound at least 10 dB(A) less than initial levels, with a general target level down to 80 dB(A). This reduction was to be achieved under normal driving conditions as well as during standard test conditions.

The investigations resulted in a research vehicle emitting 79 dB(A) at 7.5m. Although the effect on initial and maintenance costs of the quietening methods are still being evaluated, indications are that the purchase price of the vehicle quietened to 80 dB(A) would be 8-10 per cent more than the standard vehicle of this weight and engine power. A demonstration vehicle was developed by Foden and Rolls-Royce from the research vehicle and built to production standards. The external noise levels of 80 dB(A) at 7.5m is believed to be the lowest noise level so far emitted by a commercially viable goods vehicle of this weight and power. Tyre noise was also studied at TRRL with the object of understanding the mechanism of tyre noise and of specifying a tyre design for the Quiet

Heavy Vehicle which would meet the target noise level of 77 dB(A). Progress in this research is reported.

'Effects of Emissions: General Effects' *Professor P. J. Lawther, Medical Research Council*

Professor Lawther and his colleagues started work on the effect of road vehicle emissions on health in 1955. The paper makes reference to the early work of Professor Lawther and his team, its 'follow-up' and their plan for future work in the light of continuing appraisal. Their earliest study was of pollution by diesel engines in garages, other workplaces, tunnels and streets. There is now a resurgence of interest in this topic due in part to changes imminent in the USA dictated by the need to conserve petroleum fuel. Professor Lawther's studies have also involved many surveys and experiments to see whether carbon monoxide would be likely, in the concentrations found in streets, to impair function of the central nervous system to a degree which might be hazardous. As a result of their studies, Professor Lawther and his team have come to believe that if CO from traffic has any effect, it may be on the cardio-vascular system of patients who are already severely handicapped by disease of the lungs or heart.

These revised throughts raise important and difficult problems about who should be protected at all times and at all costs. Although the topic of lead in petrol and lead in air was dealt with by Dr. Barltrop, Professor Lawther points out that many people who are genuinely concerned about lead emissions from road vehicles have a regrettable tendency to ignore the good news that many town dwellers have confortingly low levels of lead in their blood. He feels that this finding should surely receive as much attention as the reasons for the discovery of cases in whom the blood levels are high. The author concludes that the problem posed to society by the increasing use of motor vehicles are legion and complex; they will be solved only after careful assessment and radical action in which emotion has a proper but limited role.

'Effects of Emissions: Lead' *Dr. Donald Barltrop, Westminster Medical School*

The paper opens with a brief history showing a pattern of lead use and exposure of population to lead. The clinical response to lead is outlined within four grades corresponding to various degrees and durations of exposure. The author concentrates on health effects among children exposed to lead and gives typical close/response relationships. He explains the factors which must be taken into account in the assessment of any particular set of blood and lead data. In his study of lead metabolism, the author considers both atmospheric and dietary sources of lead. Sub-clinical effects are also discussed.

'Legislative Control of Motor Vehicle Emissions' *Malcolm Ellis, Department of Transport*

The scope of and background to current legislation is summarised and an indication is given of future standards that will have to take into account not only the social and environmental consequence but also economic and energy conservation implications.

'The Technology of Controlling Exhaust Emissions' *Dr. John B. Weaving, BL Cars Limited*

The principal pollutant gases from spark ignition engines are carbon monoxide, unburnt hydrocarbons and nitric oxide. These pollutants have been considerably reduced and can be reduced still further at a cost. While carbon monoxide and hydrocarbons can be reduced without deterioration of fuel consumption, it is very difficult to reduce oxides

of nitrogen without impairing engine efficiency With reference to the current requirements in the USA and in Europe, the author outlines possibilities for reducing pollutants

In greater detail, he discusses the low pollutant engine, homogeneous type engines, which take in a lot more air and thus reduces nitric oxides without the need to employ a catalyst, and stratified charge engines. Weak-burn homogeneous engines have several limitations, including loss of efficiency (which can be overcome by raising the compression ratio which in turn produces a greater tendency towards detonation or knocking) Another limitation is the difficulty of providing each cylinder with the same air/fuel ratio Several types of stratified charge engines are under investigation in an attempt to overcome the limitations of the weak-burn homogeneous engines. These are broadly divided into two classes, the open chamber and the pre-chamber types, both of which are discussed in the paper The author emphasis that although there are many ways in which pollution from road vehicles can be reduced there is no single way in which it can be reduced without either loss of efficiency or increased costs. In the end the public have to decide what they are prepared to pay for clean motoring

The above papers are available at 60p each (incl. p. & p.). Complete sets of papers, including Part II, Reports of Discussion, are available now at £5.75 (incl. p. & p.) from: NSCA, 136 North Street, Brighton BN1 1RG. Tel: (0273) 26313.

EFFECT OF EMISSIONS: LEAD

by

DR. D. BARLTROP

Department of Child Health, Westminster Children's Hospital

Paper presented at the NSCA Workshop on Pollution from Road Vehicles, Warwick University, April 9-11, 1979

Lead was known and used for some 5,000 years before the invention of the internal combustion engine. It is a natural constituent of the earth's crust with which mankind has lived inescapably in contact. It has numerous valuable applications, many of which were discovered before lead alkyl additives for motor fuels. These applications continue to be valued by society so that any contributions to atmospheric lead made by automotive emissions must be set in the context of widespread recovery, utilisation and dispersion of this metal.

Historical Background

One of the first descriptions of lead toxicity was by Hippocrates in the 4th century BC who recorded the symptoms of colic in a man who had been smelting lead. This was one of the first recorded examples in which airborne lead was recognised as a cause of disease. Subsequently, during the next two millennia, reports of adult lead poisoning appeared at intervals almost all due to the contamination of foodstuffs or beverages; thus, in the 1700s a massive outbreak of lead poisoning in the West Country was associated with the introduction of lead sheet and pipe in to the apparatus for the manufacture of cider. During the Industrial Revolution, a whole new range of applications for lead emerged including pigments, solders, ammunition, batteries, and glaze for ceramics. This created particular hazards for workers engaged in manufacturing and at the turn of the century there were approximately 1,000 cases of lead poisoning per annum in industry with approximately 100 deaths. This situation has been progressively controlled and the last adult industrial death from inorganic lead was some 20 years ago.

By contrast, during the last 30-40 years, lead poisoning in childhood has been increasingly recognised. In England and Wales, about 100 diagnoses of lead poisoning are made each year with 2-3 deaths in children. This, of course, is in contrast to data from the United States where active detection programmes identify some 40,000 cases of 'undue lead absorption' as distinct from 'poisoning' each year. Much of this apparent discrepancy is a matter of semantics and reflects the physician's uncertainty as to the definition of poisoning as opposed to exposure.

Clinical Features

Clinically, the response to lead can be sub-divided into four grades corresponding to various degrees and durations of exposure. Grade 1 corresponds to that exposure generally encountered in the population and is associated with lead in food, beverages and atmosphere. Grade 2 represents increased exposure but in which the subject is still asymptomatic. Grade 3 results from increased or continuing exposure of sufficient degree to cause symptoms. Grade 4 is associated with impaired central nervous system function so that convulsions, coma and death may

supervene. These four clinical grades can be equated with increasing amounts of lead in the soft tissues of the body which in turn is reflected by the blood lead concentration. In the case of children, the blood lead concentration. In the case of children, the blood lead values associated with these grades are 40, 40-60, 60-80, 80 *u*g/100 ml. The four grades represent an accelerating progression of events, so that Grade 1 is sustained throughout life but the subsequent grades may be represented in months, weeks and days respectively. The interpretation of blood lead values is confounded by:

(a) individual variation in clinical response;
(b) lack of data concerning dose response relationships. Thus, in Grades 3-4, the values do not represent thresholds above which certain clinical features become manifest but by contrast they represent values below which they do not, or are unlikely, to occur.

Dose Response Relationship

Little information exists concerning the magnitude of the blood lead concentration or the prevalence of clinical features in relation to the dose of absorbed lead. However, in a few children, symptomatic poisoning has been associated with the ingestion of about 1000 *u*g of lead per day for approximately four months. This amount of lead can be contained in a fleck of lead-based paint weighing only a few milligrams. There have been few comprehensive surveys of the concentration of lead in blood in either adults or children in the UK although this is now being attempted as part of an EEC collaborative programme. Typically, the distribution of values for blood lead concentration follows a lognormal curve with a peak at about 20 *u*g/100 ml and the majority of values at less than 35-40 *u*g/100 ml. Population, as opposed to individual exposures, are therefore best represented by the geometric mean blood lead value and using this index there would appear to have been little change in UK populations during the last 20 years. Moreover, values obtained from rural districts with low airborne lead concentrations do not differ greatly from those encountered in urban districts. This fact alone suggests that airborne contribution to absorbed lead may be difficult to detect.

Data Interpretation

The clinical response to an anomalous value or group of values must be the presumption either that they represent an unusual ingested source of lead or that the response of the individuals concerned is unusual. A survey of British paediatricians three years ago showed that some 70 cases of 'lead poisoning' were identified and that almost all of the blood lead values reported were in excess of 40 *u*g/100 ml. The sources of lead to which exposure were attributed showed that approximately a third were directly related to old lead-based paint, about a third to a variety of other ingested sources but in the remainder the source had not been identified. In no case was airborne lead considered to be a factor. An undue proportion of the reported cases were Asians and this stimulated a large scale survey in which the response of Asian children to environmental lead was compared with indigenous controls. The data obtained showed that the Asian blood lead distribution curve as a whole was displaced suggesting that there was a difference in response for this ethnic group which is almost certainly nutritional in

nature. Similar displacements can be recognised in indigenous population groups, however, in association with contaminated soils and dusts. Thus, studies on children living on soils of mean lead content 14,000 ppm (1.4%) showed that the mean blood lead values were increased by approximately 0.6 *u*g/100 ml for much lesser ppm in soils and dusts.[1] Many other variables have been identified including the age of the child, the season of the year and the parental occupation. All of these factors must be taken into account in the assessment of any particular set of blood lead data.

Lead Metabolism

Atmospheric

The magnitude of the atmospheric contribution to absorbed lead has been assessed in a variety of ways both in the laboratory and in the field. In each case, however, the contribution has to be related to the total absorbed dose of lead from all sources. In the case of both inhaled and ingested lead, assumptions have to be made concerning a fraction of lead which is absorbed. A typical calculation for an adult might therefore be as follows:

Table 1

	Lead *u*g/day		**Percentage**
	Intake	Absorbed	(of total absorption)
Lead in diet	300	30	75
Lead inhaled	30	10	25
Total		**40**	**100**

If the values obtained by such calculations are related to a blood lead value of say 20 *u*g/100 ml then it follows that about 5 *u*g/100 ml of the blood lead has been derived from the atmosphere and 15 *u*g/100 ml from the diet. This corresponds with the estimate of Chamberlain *et al,* 1978[2] which equated an atmospheric lead value of 1 *u*g/m^3 to a blood lead increment of 2 *u*g/100 ml. In the example given, it follows that 4 *u*g as opposed to 5 *u*g/100 ml in the blood were derived from atmospheric sources. In real life, however, these relationships are not so readily discerned, perhaps because of the relative magnitude and variability of the ingested as opposed to the inhaled fraction. Thus, in the 'Seven Cities' study of Tepper and Levin involving 1,900 white women at various locations in the US, it initially proved to be difficult to find any relationship at all between airborne and blood lead values. In urban Philadelphia, where a geometric mean blood lead value was 1.67 *u*g/m^3, the blood lead was 20.12 *u*g/100 ml, whereas in Los Angeles, the corresponding values were 3.39 *u*g/m^3 and 17.59 *u*g/100 ml. More sophisticated analysis of the data, however, has now shown that for any given area the urban: suburban difference is consistent and corresponds with an airborne lead contribution of 18% to the variability of the blood lead values observed. (Note: 18% of the variation and not 18% of the blood lead). Comparison of the urban. suburban differences in various locations, however, still revealed anomalous results.

The values given in Table 2 show that the urban/suburban excess for lead in blood in New York was associated with the greatest difference in airborne lead values. From these data, it would thus appear that the airborne blood lead

relationship can vary between 1:1.4 to 1:6.1. Tepper and Levin[4] have extended their studies (1975) to study urban/suburban differences in blood and air lead concentrations with essentially similar results and concluded that although the results 'partially reflect lead absorption from ambient atmospheres' the lack of correlation on a national basis suggests that 'factors other than atmospheric lead levels are of relatively greater importance in determining blood levels in population groups'. Some support for this contention is found in the lack of any data from countries which have removed lead additives from motor fuels but have so far not yet reported any diminution in blood lead values as a result.

Table 2 *(Hasselblad and Nelson, 1975.)*[3]

	Urban/Suburban Excess	
	Blood ug/100 ml	**Air lead ug/m³**
Chicago	3.53	0.58
Philadelphia	2.24	0.52
New York	1.22	0.96

Diet

Information concerning the fraction of lead absorbed from the diet has been sought by means of metabolic balance studies in both adults and children. Marked variation in the retained fraction has been found and in prolonged or sequential balance studies, periods of both positive and negative balance may be identified.[5] The data merely indicates the need for extremely prolonged studies if meaningful results are to be obtained. Moreover, doubt is cast on the traditional value of 10% retention of lead from dietary sources described by Kehoe.

Sub-Clinical Poisoning

Recently, a number of authors have argued that lead may have significant 'sub-clinical' effects at the values encountered in the general population, that is to say, that small variations within the accepted normal range of blood lead values, may be associated with undesirable or adverse health effects. These arguments in general rest on the demonstration of association between tissue lead values (blood, hair, teeth) and indices of disturbed behaviour, impaired intellect or minor neurological dysfunction. These relationships have been used to support the argument that lead should be removed from motor fuels and, recently in this country, to sustain objections to the construction of a new motorway. While there is little doubt that such relationships have been demonstrated, this does not, of course, prove the existence of a cause and effect relationship. Thus, increased blood lead values may reflect some other common variable, such as place of residence or social disadvantage. Examples of such apparent relationships abound in the medical literature, for example, the relationship between the number of maternal siblings as a determinant of perinatal mortality. The main argument against the sub-clinical hypothesis is, of course, that children who have sustained relatively massive exposure from static sources with blood lead values in the 40-80 range or more, do not appear to show any increased prevalence of those sub-clinical effects. This suggests that lead is not a causative agent since a dose-response relationship has not been demonstrated. Nevertheless, it is accepted that some metabolic

disturbance (increased free erythrocyte protoporphyrins) and inhibition of certain enzymes (amino-leavulinic-acid dehydratase) attributable to lead can be demonstrated in the 'normal' population.

Conclusion

Although no clinical effects have yet been attributed with certainty to the blood lead values encountered in normal populations, or to the incremental blood lead values due to atmospheric lead exposure, complacency would be inappropriate. It is suggested, however, that if measures to control the exposure of populations to lead are deemed to be necessary, then an appropriate order of priorities should be devised. A logical sequence would be the elimination of sources associated with those grades of exposure which result in clinical disease (lead-based paint and cosmetics) followed by control of the major sources of lead in diet and beverages.

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DIVISIONAL NEWS

JOINT MEETING OF THE SOUTH WEST, LONDON AND SOUTH EAST, AND CENTRAL SOUTHERN DIVISION ON 3RD APRIL, 1979

Southampton University hosted the first ever joint meeting of the above Divisions which was attended by 31 members. The subject for discussion was 'Environmental Noise Control' and the meeting, chaired by Don Barnett (Bristol City Council), was addressed by Peter Sutton (Esso Petroleum Co. Ltd.) on the industrialists' role, Geoff Charnley (Southampton City Council) on the local authorities' role, and Ken Ratcliffe (Wolfson Unit) on the consultants' role.

The three speakers, all field leaders within their respective disciplines, then participated in a lively discussion period which included topics such as noise abatement zones, best practicable means, and the use of noise restricting conditions attached to planning consents. Many members considered that, despite the practical difficulties of the Control of Noise (Measurement and Registers) Regulations 1976, noise abatement

zones could be used to particular advantage at the planning stage of large commercial/industrial developments.

The principle of holding joint meetings appeared successful and it is hoped will be repeated in the future by these and other Divisions.

H. R. Nowell
Hon. Secretary

EAST MIDLANDS DIVISION

Delegates assembled at Lound Hall, Bevercotes Colliery on 29th March 1979 and in the absence of both the Chairman and the Deputy Chairman, the Chair was taken by Mr. K. R. Enderby immediate past Chairman. After the conclusion of the business meeting, the Chairman introduced Mr. W. Erskine, Chief Electrical Engineer of the North Nottinghamshire Area of the N.C.B. Mr. Erskine welcomed delegates and gave apologies for Mr. Grainger the Area Chief Engineer, who was unable to be present.

Mr. Erskine said that Bevercotes was a modern colliery and was all electric apart from standby and compressed air equipment. Energy requirements were 30,000 hp with a maximum demand of 10,000 KVA, consuming ¾m units/month at a cost of £80,000 – equivalent to the supply for 10,000 homes.

Power requirements (per cent total demand) were:

Winders	14.3
Ventilation	24.0
Coal Preparation	15.0
Methane Extraction	1.5
Total underground including cutting and transport	36.0
Ancillaries	9.2

Bevercotes has two shafts 24ft dia and more than 960 yards deep and operated by towers 140ft high. One is used for men and materials and has room for 60 men. The second, operated by two 1,733 hp motors raises skips filled with coal holding 12 tons of coal at a time. The operation of loading and unloading and the operation of the winders through the shafts is fully automatic. As one skip is being loaded underground the other is being discharged at the surface. Speed of travel reaches 34 mph.

The scheme makes for consistency of operation and reliability. When a system is made automatic each step needs to be proved. The emergency functions are also automatic. In the event of power failure, there are duplicate supplies for full load and an emergency supply to the main face.

The Control Room has the latest computerised control. This operates the underground conveyor and also monitors the environmental condition for methane. There is a print out on running times and these can be seen on a Visual Display Unit (VDU).

Communications via a PABX system make it possible to speak to any part of the coal face underground and the Chief Electrical Engineer can speak from home to any part. There is still a normal telephone exchange for outgoing calls. The coal preparation plant has another control room complete with mimic diagrams.

Rapid loading bunkers are operated in conjunction with 'Merry-Go-Round' trains.

The presence of methane can be a problem. The Park Gate seam is moderately gassy and the procedure is to drill ahead and to the side to provide a methane Drainage System. Samples are extracted from miles underground and recorded at the surface. There are local methane measurements in addition. Having got the methane to the surface it is used in boilers, etc. and strict security and purity precautions are imposed. The annual saving in fuel is equivalent to £30,000. Ventilation equipment takes more than 2,250 hp and duplicate facilities are provided.

As a result of electrification only Sherwood is now left with any large boiler capacity, and the boilers are equipped with approved stoking equipment and grit arresters.

The DOE Code of Practice on noise is complied with and there are regular surveys by the Regional Scientific Staff.

The process of getting coal produces a large dust problem. Legislation is stringent. Samples are taken once a month and water sprays are operated.

In the UK and elsewhere, coal is won from up to 8m from the surface and up to 1,100m below. Due to the geometric gradient a temperature of 50°F exists 50ft below the surface and increases by 1°F for every additional 50ft depth. The Health and Safety at Work Act 1974 places a responsibility upon the mine Manager to maintain a suitable humidity and temperature. World standards differ, but the NCB have accepted 28°C as the upper limit. The usual method was to increase the ventilation air to increase the cooling effect, but the optimum ventilation factor is now being reached. At 40,000 cfm the energy heat gain is 1,000Kw. Bevercotes takes 750,000 cfm and costs half a million pounds per annum. Cooling plant is used to keep the temperature below 28°C. Motors used underground have to be water-cooled to enable them to be used in restricted areas.

Following Mr. Erskine's opening address, the delegates divided into groups to be conducted round the various surface workings.

E. F. Raven
Hon. Secretary

NORTHERN DIVISION

Fifty-one members of the Northern Division attended a meeting held on 7th March 1979 at Gateshead Town Hall. After the normal Divisional business, the members enjoyed an interesting and informative presentation by Mr. G. W. Robinson and Mr. D. L. Newman, the Divisional Manager and Field Sales Manager respectively of Phillips Petroleum Products Ltd.

Mr. Robinson commenced by briefly tracing the history of the oil industry from early biblical times up to date. He displayed photographs and pictures together with samples of oil and rock from under the North Sea and described the differences between the crude oil found in various parts of the world before introducing the film 'The Ekofisk Story'

The film told of the co-operation between the Norwegian Government and the Phillips Company which led to the drilling of the wells in the Ekofisk field and the eventual discovery of oil and gas after numerous failures. The 'blow out' at Ekofisk which received so much publicity at the time was shown and gave some idea of the appalling conditions that Red Adair and his team had to work under in order to stop the 'blow out' and bring matters under control. Currently oil is being pumped ashore at Teesport while gas is piped under the sea to Emden in Germany, and the efforts being made by the company to minimise any possible detrimental effects to the environment, both out in the North Sea and when the products are brought ashore, were rightly given prominence.

Mr. Newman completed the presentation by a short talk on the current situation in the oil industry with particular reference to the possible effects of the recent internal problem in Iran.

The presentation was very well received by members who asked numerous questions of the two speakers who were thanked at the close by Mr. J. Taylor, Chief Environmental Health Officer, Castle Morpeth D.C.

C. R. Cresswell
Hon. Secretary

DIARY OF EVENTS

5 July (Thursday)
p.m. Technical Committee Meeting, London.

19 July (Thursday)
a.m. (11.30) Annual General Meeting of the NSCA.
Huxley Building, Imperial College, London.
p.m. Meeting of the new Council of the Society, Imperial College.

26 July (Thursday)
a.m. Parliamentary and Local Government Committee Meeting, London.
p.m. Conference and Publicity Committee Meeting, London.

6 September (Thursday)
p.m. General Purposes and Finance Committee Meeting, London.

INTERNATIONAL NEWS

FEDERAL REPUBLIC OF GERMANY

PAH Conference Hanover 1979

An international Conference on POLYCYCLIC AROMATIC HYDROCARBONS will be held in the Medical School (Medizinische Hochschule) Hanover (FRG) from September 18 to 21, 1979. This meeting is being arranged by the VDI Clean Air Division (VDI-Kommission Reinhaltung der Luft). The programme has been arranged as follows:

Section I: Origin and physico-chemical characteristics of PAH. Methods and results of PAH measurement at source and in ambient air.

Section II: PAH epidemiology (place of work and ambient air). Biochemistry of carcinogenesis. Short-term and long-term testing methods. Basic rules for the establishment of PAH limitations.

Further information from: VDI-Kommission Reinhaltung der Luft, Postfach (POB) 1139, 4000 Dusseldorf 1.

ARGENTINA

5th International Congress

Submission of summaries to national Associations:	until September 30, 1979
Submission of summaries to the 5th Congress:	until November 30, 1979
Submission of papers to national Associations:	until February 29, 1980
Submission of papers to the 5th Congress:	until May 31, 1980

UNITED STATES OF AMERICA

72nd APCA Annual Meeting and Exhibition

This event will be hosted by the APCA's East Central Section, and will be held in Cincinnati, June 24-29, 1979. The theme of the meeting is 'Growth and Clean Air' and an excellent technical programme will feature approximately 250 papers and panels. The meeting and the control equipment and instrumentation exhibition will take place in the Cincinnati Convention and Exposition Centre, in downtown Cincinnati, Ohio, USA.

GLOBAL CLIMATIC CHANGE

A recent article by Dr. John Gribbin (*New Scientist,* March 29, 1979), points out that despite concern about the environmental impact of burning fossil fuel, cutting down forests seems to be the major cause of the increasing carbon dioxide concentration of the atmosphere.

A number of experts now hold the view that the steady build-up of atmospheric carbon dioxide is a serious threat to our climate through the so-called greenhouse effect; the gas traps infra-red radiation that would otherwise escape, thus pushing up the global temperature. But, says Dr. Gribbin, what has surprised many people studying this problem is that the forests, the lungs of the world, appear to be producing more carbon dioxide than they are breathing in. Every year more trees are destroyed than are planted and latest analyses suggest that the net effect of man's activities is to destroy the world's plants, particularly forests, so that as much carbon dioxide is being added to the atmosphere each year from burning wood, slash and burn agriculture, and oxidising humus as from burning fossil fuels.

The great importance of this new discovery is that even at present levels of fossil fuel consumption, the forests of the earth still control the carbon dioxide concentrations. If biomass was not destroyed on such a large scale, it might well be able to cope with the extra carbon dioxide from fossil fuel burning, removing once and for all the threat of the global greenhouse. Research undertaken by John Adams and his colleagues of the University of Sao Paulo, shows that in Brazil alone the ratio of net wood loss to net fossil fuel loss is at least 5:1, that is, five times as much carbon is released from forestry and agriculture as from fossil fuel each year. Adding in estimates for other regions of the globe the research indicates that fossil and non-fossil sources must now be running neck and neck as providers of carbon dioxide. The researchers say that without the concurrent deforestation in this century, the build-up of atmospheric carbon dioxide 'would have been very minor at best'.

There is no immediate prospect of halting deforestation, so that it has become equally urgent to find out how far man's activities, both in burning fossil fuels and in cutting down forests, can go before irreparable damage is done to the remarkable system which has balanced the carbon budget for so long.

CANADA

Environment Minister Calls for Ban on Chlorofluorocarbons in Spray Cans to Protect Ozone Layer

New regulations under the Environmental Contaminants Act have been announced which would ban certain chlorofluorocarbons as spray-can propellants in hairsprays, deodorants and anti-perspirants. The ban is intended to reduce the rate of depletion of the ozone layer of the earth's atmosphere.

Len Marchand announced the regulations, which were published in the *Canada Gazette* on March 24, 1979, while releasing a statement by Environment Canada that shows the threat to the ozone layer is greater than earlier estimated.

'Our research, as well as that conducted in other countries, was aimed at predicting ozone depletion. The verdict is not unanimous among the world scientific community, but the consensus is that a 15 per cent reduction in the ozone layer by the year 2000 can be expected, based on the 1973 chlorofluorocarbon release rate,' Marchand said. Earlier estimates had put the depletion at 10 per cent.

'Our scientists advise that there is an urgent need to control chlorofluorocarbon emissions, and the government has received many public representations calling for action to protect the ozone layer. These new regulations respond to those scientific and public concerns as a first step towards solving the ozone problem.'

Marchand said studies are now under way to find ways of replacing non-aerosol uses of chlorofluorocarbons with environmentally acceptable alternatives.

Canada produces only 2 per cent of total world emissions of chlorofluorocarbons into the atmosphere. A 50 per cent reduction in aerosol spray consumption has already been accomplished in Canada, as a result of action taken by Environment Canada in December, 1976, when discussions began with industry representatives.

ENVIRONMENTAL MONITORING CONFERENCE

University of Warwick, Coventry, 11-12th September 1979
Institution of Mechanical Engineers

This conference, being organised by the Environmental Science and Technology Section of the Institution, will have four main technical sessions at which 14 papers will be presented in an attempt to achieve the following objectives: to review the state of the art in the field of instrumentation and control systems for protection of the natural environment. Recent sensor and systems developments in the field of air and water pollution control will be presented and so too will a number of case histories; relevant developments in the field of monitoring ambient noise will also be included.

Emphasis in respect of case histories will be placed on the degree to which original objectives have been achieved, beneficial spin-off and economic considerations. Possible shortcomings in respect of equipment performance and in the man/machine interface area will also be discussed and in this context the value of mathematical models in the design and operation of pollution monitoring networks will be investigated.

The conference sessions will be devoted mainly to air and water, but with appropriate accommodation for those papers dealing with more general aspects. There will be opportunities for discussion at each session.

The Conference will include a Conference Dinner on the evening of Tuesday, 11th September. Residential accommodation will be available in the University's Halls of Residence at the following charges: Monday evening, 10th September Evening meal, bed and breakfast £12.50 (plus VAT). Tuesday evening, 11th September Bed and breakfast £9.25
(The cost of the Conference Dinner is included in the Registration Fee.)

Registration Fees, excluding residential facilities will be £63.00 (plus VAT) for Members of the Institution and £80.00 (plus VAT) for non-members. Preprints of the papers will be available about one month before the date of the Conference.

Forms for registration are available from the Institution's Conference Department at 1 Birdcage Walk, Westminster, London SW1H 9JJ. Technical information about the programme may be obtained on application to Mr. A. J. Tugwell, Assistant Groups Secretary, at the same address.

TOXIC EFFECTS OF ENVIRONMENTAL LEAD

Conservation Society Pollution Working Party Symposium, The Zoological Society of London, 10th May 1979

The one-day symposium was chaired by Dr. Bryce-Smith, well-known campaigner on the subject of health effects of lead on children. Four papers were presented, two by UK authors: Dr. Robert Stephens (dissenting member of the Joint Working Party on Lead Pollution around Gravelly Hill) and Dr. Michael R. Moore of Glasgow University. Professor Herbert L. Needleman of Harvard and Dr. G. Winneke of the University of Dusseldorf were the foreign contributors.

Dr. Stephen's paper, entitled 'The effects of low-level pre-natal and post-natal lead exposure in animals', surveyed the substantial number of animal studies on the toxic effect of lead published during the last decade. He concluded that an animal is most susceptible and/or sensitive to lead during its early days of development. Effects on locomotive activity in learning ability have been reported at various levels of lead exposure and he was particularly interested in work describing the effects of lead on neuro-chemical processes and morphology changes in brain structure.

Dr. Moore has studied the contribution of water-lead concentration to blood-lead concentrations in both mothers and children. Glasgow is an area of very soft water and very high concentrations of lead in water were discovered in the older houses with lead pipes and lead-lined water tanks. Blood-lead concentrations were found to vary as the cube roots of the water-lead concentration both at first flush and from running water samples. In the study of mothers, and children at birth, 3.5 per cent were found to have blood-lead concentrations in excess of 43 *u*g/100 ml and in the children at six weeks, a similar figure of 3.6 per cent were found to have in excess of 42 *u*g/100 ml. Dr. Moore implicated increased water lead concentrations as a major contributor to the body lead burden in the sector of the Glasgow population surveyed in his study. He pointed out, however, that the total body burden of lead is achieved by the summation of all sources of exposure to lead and that the importance of one source should not be emphasised to the detriment of others if there is to be effective prevention of excessive lead exposure.

The paper presented by Dr. Winneke of Dusseldorf, entitled 'Neuropsychological studies in children with elevated tooth-lead levels', was a result of work based on the experiments conducted by Prof. Needleman, also reported at the symposium. Dr. Winneke's pilot study was conducted on a survey of milk teeth in 650 Duisburg schoolchildren. The incisors were collected in 1976. The assumption behind the study was that tooth-lead concentration mirror the injestion of lead finally excreted to soft tissue. Duisburg (population 400,000) has a lot of heavy industry, including a number of metal industries, with lead and zinc works among them. The initial survey showed that tooth-lead levels were log-normally distributed with a mean of 4.5 *u*g/g tooth (two incisors from each child were examined). From this group two sub-samples of 26 children each (aged 7-10 years) were selected to represent segments of either low (mean: 2.4 *u*g/g) or elevated (mean: 9.2 *u*g/g) tooth-lead contents.

The parents of children showing results in the upper and lower end of tooth-lead levels were also surveyed, to determine the occupation of the father and the age and sex

of the child. With these three items of information the children were paired with a control child. 26 pairs were finally found (a total of 52 children). By this elaborate pairing procedure, Dr. Winneke attempted to eradicate other, sociological factors, from his results.

The pairs of children were blindly tested for neuropsychological functions, namely intelligence and visual-motor co-ordination. Many different tests were done, some showing no apparent difference between the matched pairs of children, others showing an appreciable level of difference. The greatest difference was observed during a study based on visual and phsyiological co-ordination: coding and picture arrangement. Overall, the difference between the two groups of children was 5-7 I.Q. points. This result was similar to the results obtained by Gregory and Needleman. There were no marked results in gross body co-ordination (impairment in gbc would indicate a very high level of exposure).

One of the facts to emerge from the study was that five of the children with high tooth-lead concentrations had a lower than normal birth weight. The significance of this could not be assessed, but it might not be accidental.

Comparison of the average blood lead levels in Duisberg as compared with a clean air area showed a difference of about 4 *u*g/100 ml of blood (Duisberg: 18 *u*g/100 ml, clean air area: 13/14 *u*g/ml). Comparisons of tooth lead showed a difference of two parts per million. The Duisberg survey confirmed the importance of the industrial sources of lead. The highest tooth lead levels were exactly north-east of the lead/zinc works. At the present time all EEC-sponsored programmes concerned with the effects of lead on human health survey blood-lead. Obviously blood lead is a great deal easier to analyse, but tooth-lead surveys show a deposition of lead in calcified tissue and are therefore valuable indicators of the results of long-term exposure to lead.

The final paper presented at this symposium was perhaps the most eagerly awaited. Prof. H. L. Needleman's experimental work has received wide attention and has already, as shown by Dr. Winneke's work, produced changes in experimental techniques. Prof. Needleman is concerned with determining threshold effects of lead. The basis of his research is that the brain is the most complex organism in the universe and therefore the most sensitive, liable to be affected by low levels of lead, and that levels of lead previously considered 'safe' could result in neurological disorders.

When he was a resident surgeon in Philadelphia, Prof. Needleman taught his students to look for symptoms of lead poisoning when children were brought to the hospital in the summer months because of 'hyperactivity', emotional disability, etc. After the alert, diagnosis of lead poisoning rose by 100 per cent. Prof. Needleman explained that lead is secreted in dentine close to the pulp of the tooth (circumpulpal dentine). In a survey of lead-poisoned children, the lowest dentine lead levels was found to be 300 *u*g/g.

Prof. Needleman decided to survey the tooth-lead of normal children; i.e. children showing no apparent signs of lead poisoning, and to compare the performance of the children at the higher and lower levels of dentine lead. His survey was based on a 75 per cent sample of the entire first and second year in two Boston schools. After controlling for 39 non-lead factors, high lead children were found to perform significantly less well than their low lead counterparts on the WISC -R -IQ, particularly on verbal sub-tests, on three other measures of auditory or speed processing, and on a

measure of attention. Prof. Needleman had asked teachers, before any results were known, to fill in a questionnaire on the classroom behaviour of each of the children whose teeth were analysed. The incidence of non-adaptive classroom behaviour increased in dose-related fashion to dentine lead levels.

Prof. Needleman's conclusions are that lead exposure at doses below those which produced symptoms severe enough to be diagnosed clinically, appears to be associated with neuropsychological deficits that may interfere with classroom performance. The mean blood lead in the group was found to be 35 *u*g/100 ml – the highest blood lead in the group was 53 *u*g/100 ml. While Prof. Needleman had not determined the source of the lead to which these children were exposed, he believes that the target mean for children should be brought down to 15 *u*g/100 ml.

The above papers, and reports of discussions, will be available, late summer 1979, from the Conservation Society Pollution Working Party, 68 Dora Road, London, at £2.50 incl. post and packing charge.

LETTERS TO THE EDITOR

Dear Sir,

Lead in Petrol

The only guide we have at present which quantifies the effect of lead particles of the size put into the air by car exhaust is provided by the work of Chamberlain and his co-workers at Harwell *(Investigations into lead from motor vehicles.* UKAERE, Harwell, Nov. 1978). In this it was shown that to breathe air containing 1 *u*g of lead per m^3 will cause a rise in the level of lead in the blood of the order of 1 to 2 *u*g/100 ml. There are two important qualifications to this result. It was obtained by subjects breathing the prepared air through their mouths; had they breathed through their noses, it is likely that a considerable fraction of the lead particles would have been trapped in the nasal cavity and probably swallowed after which it could be excreted without being absorbed. Secondly, when the subject has a higher than average blood lead level, the amount by which it is raised is less than a normal subject because the elimination mechanisms are working more effectively.

From this it may be predicted that if all lead were removed from petrol the blood lead of people exposed for a large part of the time to average inner city levels, which are of the order of 1 *u*g/m^3, will be of the order of 1-2 *u*g/100 ml lower than before People spending most of the time indoors will experience a much smaller reduction. Preliminary results obtained in Germany (and reported at the Society's spring workshop at Warwick University in April), where lead in petrol and consequently also lead in city air has been reduced to very low levels, confirm this prediction.

Typically blood lead in urban populations lies between 8 and 25 *u*g/100 ml, and it is reasonable to conclude that such large differences between individuals cannot be caused by lead taken in from the air, or for that matter from any general environmental source as widely and dilutely distributed as lead in air and originating from it. Any person having a blood lead level above 30 *u*g/100 ml, which is the level at which one must begin to be concerned even though many people have been measured to have higher levels while no effects can be detected, will therefore be unlikely to experience any measurable relief from the removal of lead from the air and the effect on their blood lead level is unlikely to be as large as the difference between measurements made of their blood lead levels at different times or by different methods (and indeed of duplicate simultaneous samples made by the same method).

It is therefore misleading to suggest that there is any evidence at all that people who suffer symptoms of lead intoxication would not have suffered them if there had been no lead in the air from petrol. Campaigns to remove lead from petrol cannot prevent the kind of damage to health which is attributable to lead in their bodies even if they are completely successful. The causes of lead poisoning lie elsewhere and it is much more important to find them and make people aware of them than to pretend that significant relief can come from removing lead from petrol.

The limit imposed in the EEC of 0.40 grammes per litre on lead in petrol has been achieved at the expense of higher fuel consumption and more expensive equipment at refineries, and to reduce the limit further will become progressively more wasteful of energy either in the refineries or in cars or in both.

The purist objectives formulated in the heady days of the 1960s when the seriousness of the energy shortage was only appreciated by a few are, in many cases, far too costly to be applied now, and it is important that this should be understood by the public. If the price of fuel were raised now to what it will be before the century is out people would realise that it is not to be squandered to obtain luxury standards of air cleanliness any

more than they wish to spend their resources on any other excessively luxurious aspect of living.

But worst of all, campaigns to remove the last traces of lead from the air take away effort from much more worthy causes connected with resources conservation, population control, improvement in diet, and healthy active living.

Yours faithfully,

R. S. Scorer
Chairman: Technical Committee Clean Air Council.

Dear Sir,

Domestic Smoke Control

I read with particular interest the article by Colin Cresswell in the last issue of *Clean Air* and it is encouraging to note that in spite of the financial constraints over the last few years, Newcastle has chosen to complete their smoke control programme.

The authority for which I work, Birmingham, is also aware of the benefits to be gained by such a policy and the programme is expected to be completed in three to five years time, about 80 per cent of the City already being subject to smoke control. There can be little doubt that this has been the biggest single contributory factor towards improving air quality in the City, but it has become apparent during the last few years that the use of unathorised fuel in smoke control areas has been increasing. If the benefits are to be maintained, then some degree of enforcement is needed and obviously one way is to control the supply of bituminous coal. To this end, we receive the full co-operation of the ACMS. The alternative, of course, is to prosecute individual householders and indeed, in some instances, this has to be done. Inevitably, it often leads to bad publicity in the press since invariably offenders are elderly people or those on low income. The current policy, therefore, is to try and control the supply, but this has its difficulties due to the loophole in the legislation allowing the sale of pre-packed coal from the 'corner shop', a fact acknowledged by Mr. Cresswell. In about 70 per cent of the contraventions which are reported, the fuel has been obtained in this way. The problem has been discussed with representatives of the industry with the recommendation that the bag containing the fuel should be clearly marked to the effect that it is unsuitable for use in a smoke control area. In cases where such a warning now appears on the bag, this is totally inadequate. I have expressed my concern on several occasions to the Department of the Environment and in their last reply I am advised that local authorities do not seem to regard this as a serious problem and that the Clean Air Council has decided that there is insufficient evidence at present to justify a change in the legislation.

I cannot imagine that Birmingham is unique in having this problem and perhaps I can suggest that other local authorities who find themselves in a similar position should make representations through the appropriate channels in the hope that this particular outlet can be effectively controlled.

Yours faithfully,

M. E. Paddock, BSc, CEng, MIChemE
Environmental Protection Officer – City of Birmingham

Dear Sir,

Sale of Prepacked Coal in Smoke Controlled Areas

In the article of mine printed in the February edition of *Clean Air* reference was made to the continued sale of prepacked coal from corner shops in spite of the area being completely smoke controlled. I appreciate this is very much of an old chestnut, but in the event that any reader may think this is a minor problem which will disappear in due course without any amendment to the law, I give below the results of a recent survey in Newcastle upon Tyne.

Leaving aside the number of travelling shops, there are 98 retail shops in the City selling prepacked bituminous coal in a mixture of 28lb or 10 to 12.7kg bags. The total number of bags sold in a week is approximately 2,460, the weight of fuel involved being 615cwt or 24.6 to 31.25 tonnes. The number of bags sold per shop varies enormously, four shops sold only 1 to 5 bags per week, while one sold over 100 bags. The type of packaging varies from brown paper, black plastic, blue plastic and clear plastic to animal feed bags, while the number of suppliers totals 11.

The successful prosecution of householders continues, but the size of the problem clearly shows that we shall not overcome the problem without some change in legislation.

Yours faithfully,

C. R. Cresswell
Principal Environmental Health Officer (Pollution Control)

BOOK REVIEWS

Environment and Quality of Life. Final reports on research sponsored under the First Environmental Research Programme (indirect action). *Commission of the European Communities. 1978. 460 pp. £8.80.*

The book consists of a final summary of reports on research carried out by 127 contracts, concluding with institutes and laboratories in the Member States. Its intention, together with the direct action carried out in the Joint Research Centre, is to provide scientific and technical support to the European Community Policy on the Environment. The following subjects are covered: epidemiological surveys on the effects of air pollution; harmful effects of lead pollution; health effects of micropollutants; ecological effects of water pollutants; remote sensing of air pollution; the establishment of a data bank on environmental chemicals. According to the Commission the results of the research are exploited in the implementation of Community environmental policy material.

Environmental Health Criteria 6: Principles and Methods for evaluating the toxicity of Chemicals. Part 1. *WHO 1978. 272 pp. Sw.Fr.28.*

This edition, the first part of two separate publications, is designed to examine the general aspects of toxicity evaluation, including definitions, dose-effect and dose-response relationships, interpretation of laboratory data, ethical considerations, the establishment of environmental health standards, and factors influencing the design of toxicity studies.

In the light of the rapid growth in chemicals' use in almost every aspect of life over the last few decades, there is growing concern about the possible health hazards arising

from exposure to chemicals and an awareness of the need to monitor and reappraise the procedures for evaluating their safety.

The work should assist the reader in selecting the most suitable technique for a specific purpose and should be of interest to toxicologists, oncologists, pathologists, occupational and public health authorities.

Environment and Quality of Life. Study of the contamination of continental fauna by organochlorine pesticides and PCBs. *M. Hascoet, E. de Lavaur. B. Jomand. Commission of the European Communities. 1978. 206 pp. £10.50.*

Organochlorine pesticides and PCBs, which form the bulk of the substances usually classified as persistent organochlorine products, have, during recent years formed the subject of numerous studies. The work presented in this publication is a selection of information from previous studies, which taken together seek to make it possible to estimate the dangers to wild fauna that dispersion of these substances in the environment may cause.

The study is confined to continental wild fauna and aims to establish a relation between observed toxic effects and corresponding concentrations of the products found in the various forms of tissue of the animals. It does not claim to be a complete survey of the effects of persistent organochlorine products on animals and most data collected relates to birds and mammals.

Environment and Quality of Life. Third International Symposium on Ceramics. Bologna October '76. *Proceedings of the Session on lead and cadmium release from ceramic glazes. Commission of the European Communities. 1978. 74 pp. £5.*

The various authors whose papers are presented in this volume had been requested to review the progress made in their particular area, paying particular attention to work relevant in the preparation of the proposed Commission Directive on lead and cadium release from ceramic-ware intended to come into contact with foodstuffs.

Altogether, six papers are presented and, according to the Commission, these provide a reasonably comprehensive review of the work carried out to establish the requirements of their proposal.

'Air Pollution - its dispersion and effects'. A monograph. *Atkins Research and Development, February 1979, 59 pp. £4.00.*

This well-illustrated monograph examines how atmospheric pollutants are dispersed, how these processes can be measured and predicted, and the possible effects of pollutants upon the natural environment, human health, amenity and materials. The sections on measurement/monitoring and on modelling are of particular value, providing an excellent guide to the three general approaches to monitoring, and the prediction of dispersion from a future source of emission. Four typical case studies undertaken by Atkins Research and Development are described at the end of the monograph. Altogether, this is an extremely useful and readable publication, available from: Atkins Research and Development, Woodcote Grove, Ashby Road, Epsom, Surrey KT18 5BW.

Environmental and Quality of Life. An evaluation of economical consequences resulting from the application of directive proposal Com (75) 681. 'The use of low sulphur fuel oils with the aim of decreasing sulphurous emissions.' *R. J. Ellis. Commission of European Communities. 1978. 85 pp. £5.*

The purpose of the study, commissioned by the Environment and Consumer Protection Service, is to evaluate where possible in terms of cost, the consequences of

implementing the draft proposed fuel oil sulphur directive Com (75) 681 within the nine member countries of the EEC.

An assessment has been made, based on data provided by the EEC Commission, of the location and size of protected zones as defined by the EEC draft fuel oil sulphur directive. The required quantities of low sulphur fuel are identified per country and calculations have been made to estimate the additional quantities of low sulphur crude oil required. There is also an indication of resulting costs.

The report was prepared to allow individual countries to make their own studies in the hope of obtaining an even better appreciation of the situation.

Environment and the Quality of Life. On the future average mercury content of air, soil and river sediments in the EEC and in the world's oceans. *R. H. Van Enk. Joint Research Centre - Ispra Establishment. Applied Mechanics Division. Commission of the European Communities. 1978. 54 pp. £4.20.*

Whilst metallic mercury and mercury compounds occur naturally in the environment and are present only at low levels under normal conditions, the increasing amounts being released through industrial processes and the consumption of mercury-containing primary materials has given rise to growing concern about the problem of mercury pollution.

Approximately 1,700 tons of mercury per year are being discharged into the EEC's environment due to the use of mercury and a further 600 tons is released by the consumption of coal, oil, natural gas and the refinement of metals.

Since the small decrease in demand, initiated after 1969, is planned to continue in the future, this study, commissioned by the Environment and Consumer Protection Service of the Commission, aims to estimate the impact of reductions in certain mercury consumption sectors on the future mercury concentration levels in the EEC. Details of a further study, investigating the impact of the total mercury released throughout the world on the average mercury content of the oceans, is also included. For both studies use was made of a time-dependent computer model, which, by simulating the pathway of mercury through the environment, gave average concentration levels in the atmosphere.

Environment and Quality of Life. World TiO2 industry projects and their environmental impact. *Commission of the European Communities. 1978. 250 pp. £12.20.*

The titanium dioxide industry, subjected to uncertainty in recent years due to technical aspects, is presently affected by economic and political elements. The producers of TiO2, environmental authorities and producers of raw materials each have to take into consideration possible actions by the other two groups.

Various analyses have been used to determine the probable trends of the industry and its effect on the world's environment. The study includes a description of the World TiO Industry and production together with examination of the economics of various processes and contains sections devoted to the synthetic rutile industry, raw materials and effluent treatment, environmental impact and licensing policy.

International Conference on Environmental Sensing and Assessment (ICESA) Vols. 1 and 2. 1975. A Joint Conference comprising the International Symposium on Environmental Monitoring and the Third Joint Conference in Sensing Environmental Pollutants. *Inst. Electrical and Electronics Engineers, Inc. 1976.*

These two volumes contain 241 papers submitted by scientists from 26 countries,

presenting a strong technical and scientific programme on environmental monitoring and assessment procedures and results. Areas covered vary from agriculture, gases, environmental modelling, meteorology, metals, marine environment, and nuclear fuel processing through to waste disposal, quality assurance, transportation, pesticides, organics, industrial processes and remote sensing.

NEW ADDITIONS TO NSCA LIBRARY

Atmospheric Sulphates: occurrence, formation, fate and measurement - a critical review. Dr. P. Blokker. Concawe Rpt. Nr. 7/78. 64 pp.

Environment and the Quality of Life. An evaluation of economical consequences resulting from the application of directive proposal Com. (75) 681, 'The use of low sulphur fuel oils with the aim of decreasing sulphurous emissions.' R. J. Ellis. Commission of European Communities. 1978. 85 pp. £5.

Ibid. Final reports on research sponsored under the First Environmental Research Programme (indirect action). 1978. 460 pp. £8.80.

Ibid. On the future average mercury content of air, soil and river sediments in the EEC and in the world's oceans. R. H. Van Enk. Joint Research Centre ISPRA Establishment. 1978. 54 pp. £4.20.

Ibid. Study of the contamination of continental fauna by organochlorine pesticides and PCBs. 1978. 206 pp. £10.50.

Ibid. Third International Symposium on Ceramics. Bologna Oct. '76. Proceedings of the Session on lead and cadium release from ceramic glazes. 1978. 74 pp. £5.

Ibid. World TiO2 industry projects and their Environmental impact. 1978. 250 pp. £12.20.

Environmental Health Criteria 6. Principles and Methods for evaluating the Toxicity of Chemicals. Part I. WHO 1978. 272 pp. Sw.Fr. 28.

Environmental Health Criteria 7. Photochemical Oxidants. WHO 1978. 110pp. Sw.Fr. 10.

Health and Safety Statistics 1976. Health and Safety Executive. HMSO 1979. 65 pp. £1.75.

The Hazards of Work. How to fight them. Workers' Handbook No. 1. Patrick Kinnersly. Pluto Press. 394 pp. £1.20.

Investigations into lead from Motor Vehicles. A. C. Chamberlain et al. Environmental and Medical Sciences Division. AERE Harwell. HMSO Nov. '78. 151 pp. £3.50.

International Conference on Environmental Sensing and Assessment. (ICESA) Vols. 1 and 2. 1975. A Joint Conference comprising the International Symposium on Environmental Monitoring and the Third Joint Conference on Sensing Environmental Pollutants. Institute of Electrical and Electronics Engineers. Inc. 1976. 241 papers.

Method for determining the sound-power levels of flares used in refineries, chemical plants and oilfield. Concawe rpt. 2/79. 27 pp.

The Measurement of Airborne Particles. D. Cadle. Ed. R. L. Metcalfe et al. Wiley Interscience. 342 pp. £13.85.

Noise Control in Industry. Sound Research Laboratories Ltd. Ed. J. D. Webb. Associated Book Pubs Ltd. 421 pp. £8.

Statutory Instruments 1978. No. 1811. Road Traffic. The Motor Vehicles (Type approval) (Gt. Britain) (Amendment) (No. 5) Regulations 1978. HMSO 40p.

Ibid. S.I. No. 1017. Road Traffic. The Motor Vehicles (Construction and Use) Regulations 1978. 141 pp. HMSO £2.50.

Ibid. S.I. No. 1233. The Motor Vehicles (Construction and Use) (Amendment) Reg. 1978. 7 pp. HMSO 25p.

Ibid S.I. No. 1234. The Motor Vehicles (Construction and Use) (Amendment) (No. 2). Regs. 1978. 2 pp. HMSO 10p.

Ibid. S.I. No. 1235. The Motor Vehicles (Construction and Use) (Amendment) (No. 3) Regs. 1978. 3 pp. HMSO 10p.

A Study on the rational utilisation of fuels in private transport. (Rufit) Concawe Rpt. No. 6/78. 32 pp.

COUNCIL NOISE LEAFLET

Lewisham Council has produced a leaflet telling people how the law protects them from unnecessary, unreasonable noise. The leaflet, entitled 'Noise – how the law can help you', will be freely available at libraries and other public buildings in the borough.

It explains that the relevant piece of legal protection against excessive noise is the 1974 Control of Pollution Act, and that individuals can take a direct legal action if they are an occupier of premises and are aggrieved by what they consider to be noise nuisance. They are advised to see their solicitor or local Citizens Advice Bureau to check how strong their case is before applying to the magistrates court for an order preventing or restricting the noise.

Lewisham Council, the leaflet explains, will normally only act with a statutory notice banning or restricting a noise when a large number of people are affected. It can bring legal proceedings if the notice is disobeyed.

The leaflet also explains that the Council's Saturday night 'noisy party squad' is once again in action, but that complaints must be made to the local police – who will in turn get in touch with the officer on duty. Copies of the leaflet are being sent to tenants and residents associations throughout the borough.

TLV's 1978

A revised list of recommended limits for airborne concentrations of over 500 potentially toxic substances has been published by the Health and Safety Executive.

The limits, or Threshold Limit Values (TLVs), are published in a Guidance Note* which reprints in full the list of TLVs adopted by the American Conference of Governmental Industrial Hygienists. It also lists 15 substances for which the Executive recommends different limits. The main list includes 24 new TLVs, including units for chloroform and paraquat. There are 37 substances, including aspirin and ethylene dichloride, for which there are proposed TLVs in the 'Notice of Intended Changes' section.

The TLVs are expressed in two forms: TLV-TWA the concentration to which most workers may be exposed on a time-weighted average for eight hours a day over a 40 hour working week;
TLV-STEL the short term exposure limit, or maximum concentration to which a worker can be exposed for up to 15 minutes without suffering intolerable irritation, irreversible tissue change or mental confusion. In addition, many substances are given a 'C' rating (TLV-C), indicating that this is the ceiling limit above which workers should not be exposed at all.

* **Guidance Note EH 15/78,** *available from HM Stationery Office, price 30p plus postage.*

COUNTRY COLLEGE IS TRACKING DOWN THE SUN USERS

Everyone in Britain who has a 'soft energy' installation such as solar panels or a windmill is being asked to be open to the public for one day: Sunday, 29th July.

The request is made by Country College of Digswell in Hertfordshire, who hope to see 'Soft Energy Sunday' as firmly established in years to come as the Gardeners' Sunday scheme when gardens are open to the public in aid of charity. Early in May, Country College director Anthony Wigens will be writing to national newspapers and television and radio programmes to reach as many readers and listeners as possible with his appeal.

Soft Energy users are invited to contact Country College if they are prepared to open their doors. Country College will send them an information pack, including poster, outline press release, advice on matters such as insurance, and the promise of a commemorative certificate recording their contribution to a safe and sustainable energy future. They will be invited to charge 25p entrance per adult and 10p per child, and send a cheque to Friends of the Earth after deducting expenses.

Meanwhile Country College will prepare regional lists of the Soft Energy installations open under the scheme which will be distributed free at their own Soft Energy Show in Welwyn Garden City on 13th-14th July, together with the results of the quite separate survey they are conducting through the Soft Energy Industry (Soft Energy Survey of Great Britain).

'In future we hope to make Soft Energy Sunday coincide with some other day in the environmental calendar, such as World Environment Day (5th June) or Sun Day (Saturday, 23rd June)' says Anthony Wigens, Country College Director, 'but we needed to fix our date after the Soft Energy Show this year so that we could distribute information there.'

Anyone who wants to support Soft Energy Sunday should write to Anthony Wigens at Country College, 11 Harmer Green Lane, Digswell, Welwyn, Hertfordshire AL6 0AY, or telephone Welwyn (043871) 6367.

The regional list of homes open will be available from Country College after 14th July for 25p, and the Soft Energy Survey map for 30p. Please include a 9 x 4 SAE.

STA CODE OF PRACTICE FOR THE SOLAR WATER HEATING INDUSTRY

A major part of the activities of Solar Trade Association Limited is concerned with the establishment of good standards in the solar industry. As a first step in its plan to produce codes of practice covering all sectors of the industry, the STA has prepared a code of conduct for manufacturers, suppliers and installers of solar water heating systems for domestic hot water and swimming pool applications. All STA members will conform to the code from 1st July this year.

The main aims are:
(1) To ensure that customers (whether other firms or ultimate consumers) receive the

best possible service from STA members in respect of materials, components, installation and repair work supplied or undertaken by such members;
(2) To resolve any complaints which may arise concerning any aspect of supply, installation and repair work carried out by STA members and to provide a procedure for conciliation or simple arbitration if complaints cannot be settled directly between a member and his customer.

The code covers advertising, selling, the obtaining of permission and approvals, as well as installation, service and repair. The STA's conciliation and arbitration procedures are outlined in Appendices.

A copy of the code is available from Solar Trade Association Limited, 26 Store Street, London WC1 7BT, price £1 including post and pakaging.

NEW SMOKE CONTROL ORDERS

The lists below are supplementary to the information in the issue of **Clean Air (Vol. 9, No. 1)** which gave the position up to **31st December 1978.** They now show changes and additions up to **31st March 1979.**

Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase.

The list of new areas in operation of smoke control is based on the plans submitted to the Department of Environment, but may erroneously include some local authorities who have made postponements, without notifying the Ministry of the fact.

ENGLAND

NEW SMOKE CONTROL ORDERS IN OPERATION

Northern
Gateshead No. 8.

NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Northern
Langbaurgh No. 6 (South Bank East); North Tyneside No. 12; Preston No. 39 and No. 40; South Tyneside No. 4.

Yorkshire and Humberside
Calderdale No. 3 (Ripponden-Ripponden/Rishworth); Doncaster No. 10 (Conisbrough); Harrogate No. 10 (Bilson); Rotherham (Brecks); Wakefield (Calder Grove No. 1).

West Midlands
Nuneaton No. 18 (St. Marys/Coton); Rugby No. 23; Warwick No. 13.

East Midlands
Broxtowe (Eastwood No. 3); Erewash No. 5 (Rutland, Ilkeston); Gedling No. 7; South Kesteven No. 10 (Grantham No. 26).

South East
Broxbourne No. 9 and No. 10; Milton Keynes No. 5; Oxford City No. 18; Thurrock No. 15.

London Boroughs
Barnet No. 17; Newham No. 15.

NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Northern
Allerdale No. 8; Gateshead No. 10, No. 11, No. 12 and No. 13; Stockton-on-Tees No. 16 (Oxbridge) and No. 17 (Grangefield).

SMOKE CONTROL AREAS

Progress Report
Position at 31st March 1979

(Figures supplied by the Department of the Environment, the Welsh Office, the Department of the Environment for Northern Ireland and the Scottish Development Department).

	England			*Wales*			*Scotland*			*Northern Ireland*		
Smoke Control Areas Confirmed to 31.12.78	5,013			34			271			78		
Acres		1,724,120			3,331			151,976			18,955	
Premises			7,296,619			10,754			612,085			56,602
Smoke Control Areas Confirmed (31.12.78-31.3.79)	24			—			2			1		
Acres		18,245			—			516			—	
Premises			44,260			—			6,374			4
Totals	**5,037**	**1,742,365**	**7,340,879**	**34**	**3,331**	**10,754**	**273**	**152,492**	**618,459**	**79**	**18,955**	**56,606**
Smoke Control Areas Submitted (31.12.78-31.3.79)	35			—			—			—		
Acres		16,385			—			—			—	
Premises			54,726			—			—			—
Grand Totals	**5,072**	**1,758,750**	**7,395,605**	**34**	**3,331**	**10,754**	**273**	**152,492**	**618,459**	**79**	**18,955**	**56,606**
Smokeless Zones (Local Acts) in Operation	44			—			—			—		
Acres		3,400			—			—			—	
Premises			41,060			—			—			—

North West

Bolton No. 14 (Bolton No. 53) and No. 15 (Farnworth No. 9B); Oldham No. 31 (Grotton) and No. 32 (Sack St, Crompton); Preston No. 39 and No. 40.

Yorkshire and Humberside

Barnsley No. 25 (Platts Common); Calderdale No. 24 and No. 3.

West Midlands

Coventry No. 22; Lichfield No. 3; Warwick No. 15; Wyre Forest No. 3.

East Midlands

Derby City No. 31 (Abbey), No. 32 (Breadsall) and No. 33 (Livchurch); Gedling No. 7; Lincoln No. 17; Rushcliffe No. 2.

South East

Bracknell No. 8 (Sandhurst/Little Sandhurst); Brighton No. 4; Dartford No. 18; Gillingham No. 10; Gravesham No. 5; Milton Keynes No. 5; Oxford City No. 18; Portsmouth No. 5.

London Boroughs

Havering No. 10.

NORTHERN IRELAND

NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Antrim No. 4 (Var. 2).

SCOTLAND

NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Nithsdale District (Lochside North); City of Dundee District (Wester Clepington).

CYLDEBANK BECOMES SMOKELESS

On 1st April, 1979, Clydebank District Council achieved the distinction of being the first local authority in Scotland since the reorganisation of local government to be 100 per cent smoke controlled. On that date the final smoke control area in the district – Clydebank, Kilpatrick North – came into operation.

The smoke control programme was started in Clydebank in 1960 and over the years 15 smoke control areas have been designated. The effort has not been without its difficuluties at times for the enforcing officers in overcoming problems of apathy, cuts in public expenditure, etc., but the citizens of the district can now appreciate the difference in the quality of the air.

New Partner for Cremer and Warner

After eight years of increasingly close association, Francis Oakes FIEE FIERE FIOA MBIM has accepted a Partnership in Cremer and Warner, Consulting Engineers and Scientists. This firm of pioneers in chemical engineering and pollution control has been well-known since Herbert Cremer's work in cleaning up the river Thames, and more so since their recent involvement in the Flixborough and Windscale Inquiries. Francis Oakes has been a pioneer in his own right since World War II, when he developed new methods for automatic testing of electrical components, followed after the war by innovative applications of semiconductor and computer techniques to industrial engineering, aerospace, television and acoustic technology.

Francis Oake's multi-faceted experience was given a new and sympathetic home when he joined the staff of Cremer and Warner after leaving Thorn Electrical Industries in 1971. He has built up a flourishing noise and vibration control section for the Partnership. At the present time, he is a leading member of the growing team which is making rapid progress in the UK and abroad, in developing effective techniques to combat major hazards.

INDUSTRIAL NEWS

New Generation of Petrol Engines to Rival Diesels for Economy

Ford in the United States has begun production development of a totally new generation of petrol engines which could be available for public sale early in the 1980s. Known as the Programmable Combustion, or PROCO engine, it is designed to meet the new and more stringent requirements of the 1980s, when economy and emission control standards will be even more citical than now. It will virtually equal the diesel engine in terms of efficiency, offer 20 per cent better economy than that of current piston engines, and run on low-grade 91-octane, lead-free petrol. In addition, for US applications it will require a much simpler type of catalytic exhaust after-burner than other petrol engines.

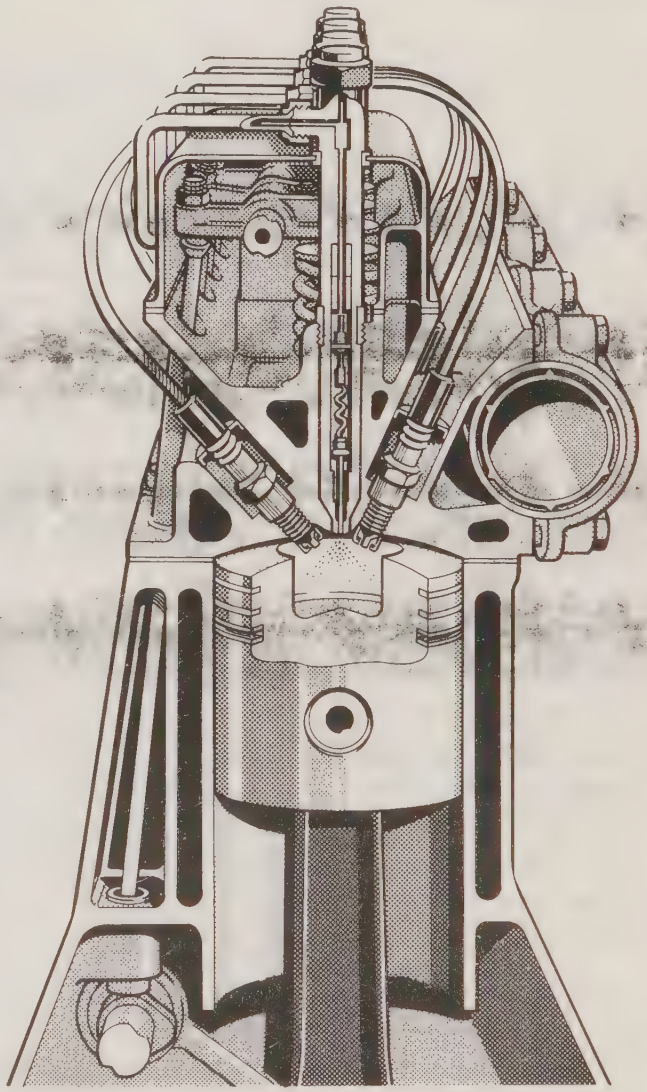
While the PROCO has met design objectives in prototype testing, there are still some significant technological aspects to be resolved. The most important is whether or not it will be possible to mass-produce the high-tolerance fuel-injection system. The company is setting up a pilot engine production line near its Dearborn headquarters to find out. The programme will also involve some on-the-road testing of engines produced on this line.

The new engine has a combustion bowl set in the crown of each piston. Fuel is injected from above, directly into the combustion chamber where it mixes with a blend of air and recycled control system. This varies the timing of the injection to make the most economical use of the fuel both in town and on motorways.

Laboratory research into the PROCO system is now complete and the project has been handed over to Ford's Production Engine Group where it will be engineered for production. PROCO engines of vee configuration will be used in Ford vehicles from the early 1980s, but the principle can be applied equally to other cylinder layouts.

The design of the PROCO combustion system was evolved from an extensive laboratory test programme, aided by analytical computer studies. In the PROCO, fuel is made to burn more efficiently by inducing carefully controlled movement of the cylinder gases during mixing.

The bowl set in the piston crown is surrounded by relatively high 'shoulders' which create substantial 'squish' during



the combustion stroke. ('Squish' is the pattern of gas stirring induced by the upward motion of the piston as it compresses the mixture in the cylinder).

The air/gas intake charge is drawn through a conventional inlet valve with its port angle chosen specifically to induce 'swirl' (rotational movement of the gases –

like the motion of bathwater emptying).

Fuel is then injected directly into the combustion chamber as opposed to being pre-mixed with air (as in a carburettor) or by indirect injection in the manifold. The injection pattern is controlled so that there is a variable-sized central 'core' of combustible mixture surrounded by a mixture of air and re-circulated exhaust gas.

This central core principle is called 'stratification' and it allows a small quantity of fuel to ignite in a larger dilution than would be possible if it were evenly distributed.

Timing of the injection pulse as well as precise metering of the minute amounts of fuel injected into each cylinder are absolutely vital to the system's efficient operation. Both these factors are varied with the speed of the engine and the load applied to it, so that no fuel is ever wasted. When the engine is idling or cruising at low speed very little fuel is required, so it is injected late in the cycle in the last moment before the spark plug fires. At higher loads, when accelerating or driving fast, much more fuel is needed so it is injected earlier to allow more time for it to vapourise and mix.

Direct injection with precision control maintains a degree of economical stratification at all times, even when the cylinders are doing most work, i.e. at maximum speed. And because the fuel evaporates within the cylinder and the combustion pattern is so well controlled, PROCO engines will run happily at compression ratios as high as 11-to-1 on cheap, regular-grade 91-octane fuel.

Increasing the compression ratio from the 8-to-1 normally required for US lead-free petrol alone accounts for an improvement of about 8 per cent in fuel economy. Diluted fuel also burns more efficiently, which in the case of the PROCO system provides further gains of around 10 per cent.

At part loads typical of normal driving, the dilution is made up of about one third air and two thirds re-circulated exhaust gas. This blend provides ample oxygen for complete combustion with the addition of a largely inert gas, which is beneficial to economy and emissions. The high proportion of exhaust gas in the ultra-lean charge reduces the need for wasteful mechanical throttling and results in further gains of 1 to 3 per cent.

Overall, therefore, the PROCO offers a fuel saving of 20 per cent over a conventional petrol engine, a margin equal to that of the current diesel engines. Additionally, it maintains the performance levels and running refinement of today's car engines as well as giving a cleaner exhaust.

PROCO will play a vital role in Ford's future power strategy and is recognised as a major step forward in engine technology.

Reader Enquiry Service No. **7928**

Ultrasonic Humidification System Improves Productivity in British Textile Mill

A new humidification system using ultrasonic techniques has increased loom efficiency and reduced fly (textile dust) problems at Scott (Dudley Hill) Ltd., the Bradford commission weavers.

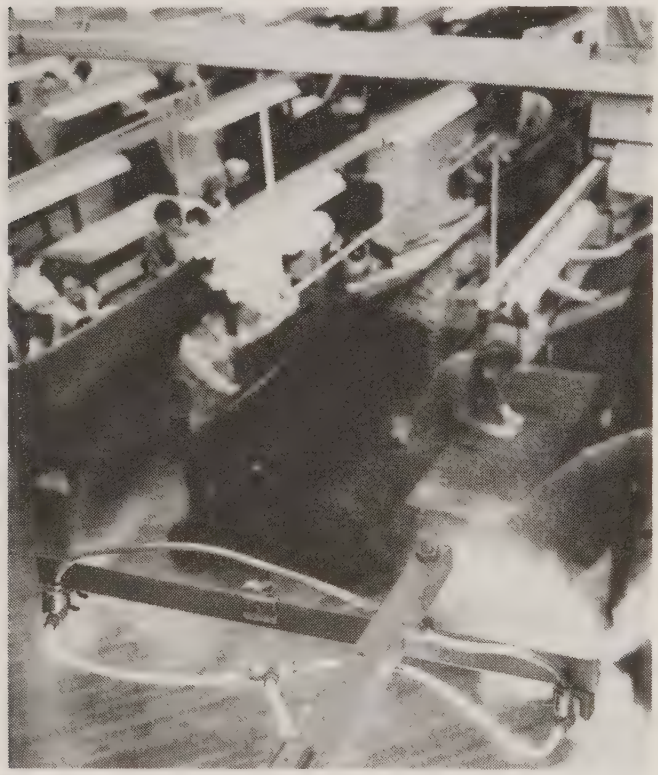
In the modern textile mill, higher room temperatures and the use of synthetic and package dyed materials have combined to create a dry, dusty atmosphere. These conditions create an unsatisfactory environment and excessive yarn weight loss and emphasise the need for an efficient and effective humidification system.

The system, manufactured by Ultrasonics Ltd., of Shipley, Yorks, consists of special water atomising nozzles mounted approximately 10ft above floor level in each area of the mill where textiles are handled. Wall mounted humidistats control and maintain the humidity at a preset level in each area independently.

The humidification is based upon the principle of ultrasonic atomisation. As water leaves each nozzle, it is shattered

into minute droplets by a standing wave of high frequency sound. Entirely safe and above audible range, the acoustic energy is generated by passing compressed air through the specially shaped nozzle.

At Scotts, the water droplets diffuse around each area and settle airborne dust by attaching to it. The reduction of fly in the air has greatly improved working conditions.



The ultrasonic humidification system, using the patented Sonicore atomising nozzles, is cheaper to operate and needs less maintenance than conventional systems using high pressure water nozzles. A water pump is required to generate the high pressure necessary for the water spray system and the fine nozzles used are liable to blockage and wear. However, in the ultrasonic system, water at mains pressure is adequate and the much larger water ports used are not liable to blockage, and wear is eliminated.

In addition to the textile industry, atomising systems from Ultrasonics Ltd., are in use in the agricultural, food, paer, plastics, mining, fuel, concrete and many other industries.

Reader Enquiry Service No. **7929**

Reader Enquiry Service No. **7930**

Electron Microscope Helps Keep the Air Clear

One of the major areas for concern in the provision of a healthy and safe environment is the problem of airborne dust. It manifests itself not only in the working environment but in the home, cities and country areas.

Regular monitoring of dust samples, notably asbestos, taken from the atmosphere in the work place is carried out by the Health and Safety Executive in Britain. Checks, using optical microscopy, and more lately the scanning electron microscope, are carried out to establish particle size, structure and range.

The scanning electron microscope, in this case a Stereoscan 180 from Cambridge Scientific Instruments, allows far more detailed examination of the specimens.

Larger particles of asbestos can be seen easily through the optical microscope, but the small fibres can only be detected using the SEM. As well as giving excellent back-up to the optical method of counting, it also allows easy calculation of the size range of fibres.

The work carried out at the laboratories is not undertaken on behalf of the public directly, but mainly as a result of inspections by Her Majesty's Factory Inspectorate and Her Majesty's Alkali and Clean Air Inspectorate.

Most of the work emanates from the factory inspectors, while in some instances studies of materials which may be causing annoyance to members of the public, such as dusts from industrial plants and so on, are called for.

A large amount of research work is also undertaken using the scanning electron microscope. For example, it is possible to examine the size and range of size of particles in dust clouds produced under experimental conditions.

Reader Enquiry Service No. **7931**

Automatic Detection and Counting of Asbestos Fibres

Two new techniques developed in Britain will enable hazards due to airborne asbestos fibres to be assessed more quickly, more reproducibly and more accurately than by current manual counting methods. One is suitable for the immediate analysis of samples collected from working environments; the other is intended to aid compliance with health and safety legislation as well as research into improved safety standards. Both techniques can be extended to evaluations of other fibrous materials.

The new rapid-monitoring equipment, to be marketed by Vickers Instruments of York, can assess conventional samples of airborne asbestos dust at rates up to 30 per hour, giving digital readout direct in fibres per ml of air sampled. The techniques involves exposing the collected fibres to a magnetic field while preparing the membrane filter for examination. This aligns most asbestos fibres either parallel or normal to the field. The sample is then examined under a specially modified microscope (Fig. 1), and the light-scatter peaks produced (which represent the quantity of asbestos fibres present) are assessed with the aid of a micro-processor. The equipment complements the company's existing microscopes designed for manual counting of airborne fibres and for identifying different asbestos-types for bulk samples.

The second new technique automatically detects and counts individual asbestos fibres. It also measures the individual length and width of fibres, providing information essential for monitoring health hazards and compliance with safety regulations. The method employs the 'Magiscan' computerised image-analysis system (Fig. 2) made by Joyce-Loebl of Gateshead, a division of Vickers Ltd. A sophisticated software package applying the Magiscan to asbestos assessment has been developed by the Wolfson Image Analysis Unit at Manchester University, and is

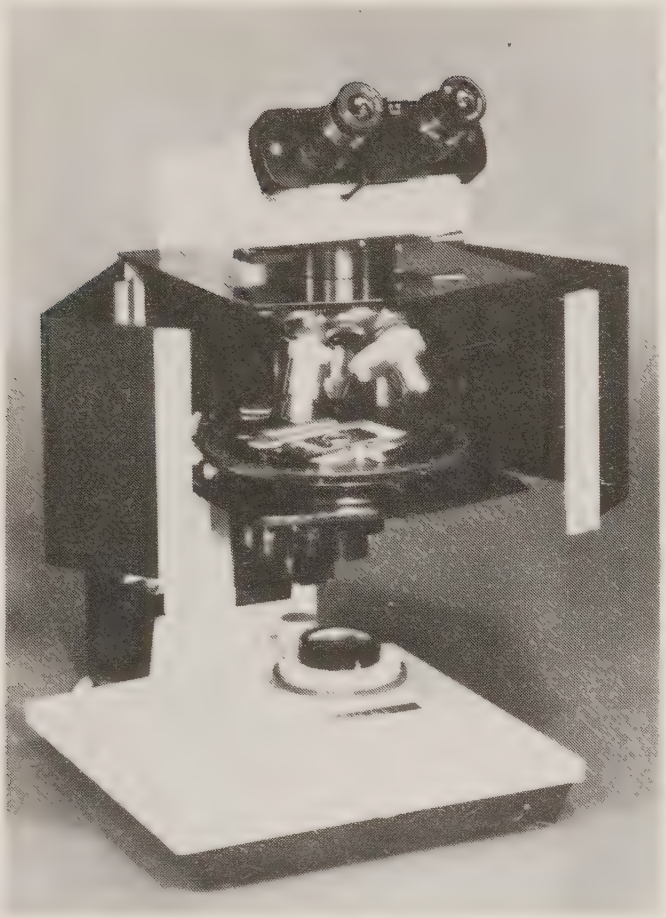


Fig. 1

Fig. 2

available from Joyce-Loebl. Britain's Asbestosis Research Council provided financial support.

Reader Enquiry Service No. **7932**

Quadruple Extraction System in Plastics for Sophisticated Plating Line

As part of a £750,000 advanced-technology electroplating line, Electroloid (Plymouth) Ltd. have supplied four separate fume extraction systems in plastics.

With this sophisticated plant, Dowty Mining Equipment Limited have substantially expanded their facility at Ashchurch, Glos. for bronze plating the steel tubes that form an integral part of their hydraulic roof support systems. The supports are used in coal mines throughout the world.

One of the main problems for the extraction system was that fumes from the plating and various pre-treatment processes are non-compatible and would produce lethal gases if mixed. For this reason four separate systems with a total capacity of 100,000 cfm were installed. Plastics were specified for the construction because of the corrosive nature of the fumes, which include cyanide, hydrogen chloride and ammonia.

Each of the systems has an 'Electroglass' water wash demister unit made of upvc reinforced with grp. The two-stage eliminator blades of the demisters remove particles larger than 5 microns with an efficiency of 99 per cent. For the recirculation of wash water, each system has a storage tank complete with drain valve, overflow refeed piping and integral pump. Most of the equipment is located on an overhead platform to give ease of access and minimum duct runs.

To ensure that noise from the extraction systems does not exceed 55 dba at the factory boundary, Electroloid fitted attenuators to the exhaust fume stacks.

Reader Enquiry Service No. **7933**

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CLEAN AIR

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AN ENERGY POLICY

As well as preaching the gospel of energy conservation, the Society has, for many years, been a keen advocate of an energy policy in which the Government should stipulate the way in which various sources of energy and power should be used. In the past, this idea of the Society's made little impression as the Government firmly adhered to the view that the choice of fuels should be left to individual consumers to decide for themselves. In other words the Government would not say that petrol was to be used as the fuel for motor cars, that district heating should be used for heating in central urban areas, or that nuclear power should be used for the generation of electricity.

But perhaps now the time has arrived, when it is realised worldwide that there is a shortage of oil, when the amount of oil and gas available to us is finite and when the price of petrol is of the order of £1.20 per gallon, for an energy policy to be gradually brought into operation. The Society have always believed in a policy of 'horses for courses' applied to the production and use of energy. Already some householders are trying to change to gas from oil for central heating while others are turning to the use of solid fuels. More coal is being used for electricity generation than hitherto. It does now seem that the time has come when oil should be used as a feedstock and as a source of power for automotive purposes; that coal and nuclear power should be used for the production of electricity, and that the electrification of the railways should be completed.

At the same time, those householders who have installed solar panels and insulation in their houses are finding that their fuel bills have been reduced by a considerable amount — not enough to recover their capital cost over a short period, but enough to show that their capital expenditure has been worthwhile. How much better, therefore, if all new houses were built with proper insulation in the first place, and all were provided with solar panels which would help to provide hot water and central heating. This would be a real energy policy in which conservation is playing its proper part; and because it would be reducing the amount of fossil fuels used, it would be contributing in a major way to the cause of clean air. We therefore believe it is time for the Society to restate its position with regard to the conservation of energy and the adoption by the Government of an energy policy. While continuing to encourage energy conservation and fuel saving, the Society should once again press for the announcement of a realistic energy policy.

THE SOCIETY'S NEW PRESIDENT
Sir Derek Ezra, MBE, Chairman, National Coal Board

At the Society's Annual General Meeting, held at Imperial College on Thursday, 19th July, Lord Flowers, FRS, President of the Society since July, 1977, invested as his successor Sir Derek Ezra, MBE, Chairman of the National Coal Board.

Sir Derek (created a Knight Bachelor in the Birthday Honours, June, 1974) was born on 23rd February, 1919, and educated at Monmouth School and Magdalene College, Cambridge – where he was a senior scholar, gained a first-class honours degree in both parts of the History Tripos, and is an Honorary Fellow.

He joined the Army as a gunner in 1939. He was awarded the MBE in 1945 for wartime services, and after demobilisation in 1947, with the rank of Lt. Colonel, joined the Marketing Department of the National Coal Board.

From 1952 to 1956 he represented the Board on the United Kingdom Delegation to the High Authority of the European Coal and Steel Community in Luxembourg and also at international committees in Paris and Geneva. In 1956 he was appointed Deputy Manager of the Inland Branch of Marketing Department at national headquarters and subsequently transferred to the equivalent post at the London and Southern Regional Sales Office.

He became Manager of the Board's London and Southern Regional Sales Office on 1st July, 1958 and was appointed Director-General of Marketing in August, 1960.

Sir Derek was appointed a Member of the National Coal Board in July, 1965 (with special responsibility for marketing) and Deputy Chairman in May, 1967. His appointment as Chairman Designate of the National Coal Board was announced on 8th April, 1971, and he became Chairman – in succession to Lord Robens – on 3rd July, 1971. He was reappointed for a further 3 year period as Chairman from 3rd July, 1976, and has subsequently been reappointed for a further period of 3 years from 3rd July, 1979.

Sir Derek is also:

Chairman of Associated Heat Services Ltd., and of J. H. Sankey and Son Ltd., and a Director and Deputy Chairman of the British Fuel Company – all National Coal Board associated companies;

Chairman of the Nationalised Industries Overseas Group;

A member of the Government's Advisory Council for Energy Conservation;

President of the Consultative Committee of the European Coal and Steel Community in Luxembourg;

Vice-President and past President of CEPCEO – the organisation of the West European Coal Producers;

Vice-President and past Chairman of the British Institute of Management;

Chairman of the Confederation of British Industry's Europe Committee, and a member of the CBI Council;

A member of the British Overseas Trade Board and Chairman of the BOTB European Trade Committee;

A member of the Council of Industry for Management Education (CIME);

A Governor of the London Business School; a member of the Court of Governors of the Administrative Staff College, Henley; a member of the Court of the Cranfield Institute of Technology; and a Governor of Imperial College.

In May, 1978 a book was published by Sir Derek entitled *Coal and Energy*. He has also written numerous articles and broadcasts frequently on subjects associated with energy, economic and industrial affairs, overseas trade and the problems of management.

He is an honorary D.Sc., and has been awarded the Order of Merit of the Italian Republic for services to trade between Britain and Italy.

ENERGY CONSERVATION FILE

GOVERNMENT POLICY

October, 1979 has been officially designated 'International Energy Conservation Month'. The 20 IEA Member States have agreed to ensure the strongest possible support for the Month at a national level, with appropriate involvement of the private sector and maximum collaboration in international events. It is hoped that the publicity given to the month will help to alert the public to the need for energy economies at home, in industry, and in the public sector. Energy Conservation is crucial to the world and it is particularly urgent in the industrialised, developed nations where energy demand is highest.

In the United Kingdom, 62 organisations have already said that they wish to support the Month, which is to be sponsored in the UK by HRH the Duke of Edinburgh. Events already arranged include the International Energy Management Conference at the National Exhibition Centre, Birmingham, from 9th October to 11th October, and the RIBA Conference 'Building – the Key to Energy Conservation' from 25th October to 27th October.

Mr. David Howell, Secretary of State for Energy, in a statement to Parliament on Monday, 11th June, said that actual oil supplies to UK consumers are on average about 5 per cent below the increased level on which people were counting. The cold winter had depleted stocks, which had to be built up for the coming autumn. He said that the Government has taken steps to achieve an overall cut in demand of 5 per cent in line with the UK's EEC and international obligations. It has been made clear that the public sector must take measures to cut down energy consumption by 5 per cent overall, consistent with the maintenance of essential services. Mr. Howell hopes that a similar 5 per cent saving will be made in industry, on the road and in the home. He emphasised that the energy shortage will not go away: North Sea oil does not offer an escape route for Britain, partly because of trading commitments and also because the UK, along with its industrial partners, has undertaken to use less oil so that the supply problem can be solved in an orderly way without a self-defeating panic.

Advice is available from the Department of Energy, especially to small and medium sized firms, on how to make the best use of available resources. The Department's Energy Quick Advice Service and the Energy Survey Scheme provide consultant's advice to help firms introduce measures which can have an immediate impact on energy consumption and also build up continuing and accumulative energy – and costs – saving. Advisory leaflets for domestic and industrial consumers are also available from the Department of Energy. The Energy Quick Advice Service freefone numbers are: Building Services questions, England, Scotland and Wales: Freefone 3140. Industry questions, England and Wales: Freefone 6222. Scotland: Freefone 8305.

The Advisory Council on Energy Conservation welcomes the fact that energy conservation is now at the centre of UK Government energy policy. In the view of the Council, there are three important requirements in the UK:

— to achieve immediate economies in the use of oil, called for by Mr. Howell;
— to replace use of oil whenever possible by alternative fuel and to develop all our energy resources;
— and to secure a major and permanent improvement in the efficiency with which any form of energy is used.

GAS AND THE OIL CRISIS

British Gas have confirmed that in the wake of oil price rises and doubts about the security of oil supply, the requests for new gas supplies are running at very high levels, especially from householders with oil fired central heating wishing to change over to gas. British Gas, although optimistic about the prospects of further large finds of natural gas around UK coasts, reckon that current supplies are sufficient to last until the end of the century, on the basis of present depletion policy. The intention of the industry's marketing plan is to direct supplies mainly into the domestic and premium sectors of the industrial and commercial market – where maximum use can be made of the fact that gas is a clean, high grade, fuel presenting no storage or transport problems to the user. This ensures that the known reserves of gas are able to make the maximum contribution to the nation's energy requirement.

In 1978 gas supplied 47 per cent of the country's domestic heating needs and 26 per cent of the heating needs of the industrial and commercial organisations. The dramatic increase in demand for gas has placed a severe strain on resources, and it is obvious that gas cannot take on a major part of the load currently borne by the oil supply industries. Oil provides for only 9 per cent of the domestic heating requirement, but 40 per cent of industrial and commercial heating needs.

PETROL ECONOMY TIPS FROM SHELL

Shell's fuel economy expert, Cecil Mitchell, has recommended that motorists should drive and maintain their cars carefully to ensure that they are not wasting fuel.

His driving tips are basic commonsense but we feel it is worth putting them on record here as a further reminder.

1. **First plan your journey.** Is it necessary? Could it be shared, or one long trip save many short trips? Avoid cold start, hurried journeys and rush hours, whenever possible.
2. **Drive smoothly** Move off on a light throttle and use gears to avoid engine revving or labouring, accelerate and corner gently and maintain speed on the lightest possible throttle opening. High speeds and traffic light 'Grand Prix' starts are certain ways to burn up fuel. Minimum braking and switching off in traffic jams and hold-ups also save petrol. Warm up the engine on the move, getting the choke in as soon as the engine will run smoothly without its assistance. Never coast with the engine out of gear.
3. **Under the bonnet.** Check sparking plugs – check that the points have the correct gap and replace after 10,000 miles. Check ignition timing and contact brake setting, also the condition of the points, distributor cap and rotor arm.

Replace a dirty air filter.

Check that the engine thermostat is working properly and change engine oil regularly. Several kinds of defect in the carburettor cause additional fuel consumption and require expert attention. For example: incorrect level in the float chamber; wear on the float needle and jet; choke not fully released in the 'off' position; accelerator pump faulty; piston or hydraulic damper stocking; split or perished air valve diaphragm. Black soot in the exhaust pipe after a longish run indicates that there is too rich an air/fuel mixture and an expert check is necessary. Make sure that the choke is pushed in as quickly as possible and that it is going fully home. Transmission, tyre pressures, brakes, wheels and steering should all be checked out.

SALFORD CITY COUNCIL/UNIVERSITY OF SALFORD LOW ENERGY HOUSE PROJECT - STRAWBERRY HILL, SALFORD

The low energy house project being undertaken jointly by the Council and the University is one of a series of experiments being conducted to help resolve social problems by the practical application of research and scientific technology available at higher educational institutions.

The aim of the project is to provide housing which, whilst consuming significantly less energy, retains all the comforts and convenience of traditionally designed homes. Broadly, this is achieved in three ways: the houses are constructed with materials designed to maximise their thermal mass for heat storage purposes; the maximum amount of insulation is provided in the cavity wall, underground and roof space, together with dual windows; and the heat is stored and distributed either by warm air transfer to a brick stock or by water circulation. The source of heat is an electrically driven heat pump which extracts heat from a water tank forming ice.

The principles developed and applied in the project will assist in placing low cost energy within the means of all householders and will contribute significantly to the alterations to housing design standards which will be essential over the next decade.

CONFERENCE: WHOLE CITY HEATING - COMBINED HEAT AND POWER

A major interdisciplinary conference on the combined generation of heat and power and its energy saving potential is being organised by the Construction Industry Conference Centre Limited at the Kensington Conference Centre, London W8, on the 21st-22nd November, 1979. The conference will include sessions on heat supplies for cities, the political and social impact of a combined heat and power future, the European and international approach and experience of CHP and the design and optimisation of systems.

The fee for the conference is £95 including VAT. Pre-prints, lunch, tea, and coffee are also provided. Further details from: The Conference Secretary (WCH) Construction Industry Conference Centre Limited, PO Box 31, Welling, Herts AL6 0XA. Telephone: Welling (043871) 6772.

CHESHIRE COUNTY COUNCIL SAVE WITH FUEL MONITORING SYSTEM

A computer-aided fuel monitoring system, used to provide detailed reports of energy consumption, is expected to be saving Cheshire County Council £1.3m per year by the mid-1980s. By providing highly detailed data on specific areas of energy use, the system enables council engineers to prevent waste wherever is occurs. By 1983 the £2.1m scheme is expected to have saved £4.9m, leading to an annual saving, at current prices, of £1.3m.

WSL TO HOLD DUST AND FUME CONTROL SEMINARS

The Department of Industry's Warren Spring Laboratory is to hold a series of one-day seminars on dust and fume control starting at Runcorn on 23rd October. Subsequent seminars at approximately six-month intervals are planned for Bristol, Glasgow, Birmingham, London and Newcastle. The Runcorn seminar will be held at the Eurocrest Hotel.

The seminars are aimed at engineers and Environmental Health Officers and will examine the latest methods for controlling dust and fumes in a work environment.

Papers will be presented by the following speakers and there will be opportunity for discussion.

Measurement and Standards — Mr. S. C. Wallin (WSL)
On Site Monitoring — Dr. G. Holt (WSL)
Generation and Control of Metallurgical Fume — Dr. P. R. Dawson (WSL)
Generation and Control of Dust by Materials Handling — Dr. C. Schofield (WSL)
Wet Dedusters and Electrostatic Precipitators — Dr. R. W. K. Allen (Separation Process Services, UKAEA, Harwell)
Bag Fillers — Mr. R. Higman (WSL)

Registration fee is £40.00 plus VAT.

Further details are available from Mr. K. W. Payne, Warren Spring Laboratory, PO Box 20, Gunnells Wood Road, Stevenage, Herts SG1 2BX.
(Tel: 0438 3388 or Telex 82250).

INTERNATIONAL NEWS

NEW ZEALAND

New Zealand Clean Air Society Inc., President's Report, 1978-79

In his Report for 1978-79, published May, 1979, Mr. P. V. Neary, President of NZCAS says that the New Zealand Government seem to have ignored the real objectives of the 1972 New Zealand Clean Air Act. He points out that the increased costs of electricity were announced as though deliberately timed to precipitate a heavy demand on domestic coal. Christchurch, in particular, suffers from a smog problem caused by the burning of coal in domestic grates. Mr. Neary reports that the Government has made no attempt to support the Clean Air legislation already passed through Parliament and that requests by the Christchurch City Council to extend the scope of the Clean Zones to cover all new appliances put into existing houses has still not been approved. The NZCAS believes it to be vitally important that only approved appliances should be installed in premises sited in Clean Air Zones.

New Zealand's North Island is fortunate in having a plentiful supply of clean fuel: natural gas, hydro-power and smokeless domestic fuel (Carbonettes). The cities in the North Island should never develop smoke pollution problems to the extent that Christchurch now experiences in the winter. The South Island has no natural gas, some of the coals are extremely smoky when burnt, and coal gas is expensive. Coke is available in Christchurch, but it is not specially made as a domestic fuel like the Carbonettes in the North Island. Because of the climate, heating requirements are greater in the South Island, and due to fuel costs and problems of supply, the tendency in South Island is to revert to the dirtier fuels.

Mr. Neary points out that, compared to solid fuel distributors in the United Kingdom, New Zealand fuel suppliers seem indifferent to the problem of reducing smoke pollution. The coal industry in South Island seems unable to maintain an even standard of quality, grading and dryness in their finished product.

While urging further government action to ensure a supply of clean fuel for the future, and to encourage the creation of more Clean Air Zones, the NZCAS feel that the New Zealand Government's actions have often been contradictory. On the one hand the Ministeries of Environment and Labour have helped the New Zealand Society towards the production and distribution of pamphlets on fuel economy measures, but in general, the Government has not heeded the Society's plea on the subject of reducing lead in petrol or on the need to expedite local authority clean air legislation.

Excessive noise is another problem that continues to concern the Society. A particular source mentioned by the President in his report is that of noise from heavy lorries. He points out that anti-noise laws will be useless if there is a lack of co-operation from members of the public and asks for the co-operation of drivers and the trade unions in an effort to reduce noise to a practical minimum. Mr. Neary also urges that 'socially responsible' professional advertisers should think of the clean air message for use in future advertisements. While the Society itself cannot afford an advertising campaign, it would welcome an acknowlegement by responsible advertisers of such problems as the smog conditions in Christchurch.

CANADA

Environmental Minister, Len Marchand has said that Canadians are so concerned about air and water pollution that most are willing to pay more taxes and higher prices to fight it.

According to a survey, an overwhelming majority of Canadians (89 per cent) consider deterioration of the environment a major concern, outranked only by inflation, unemployment, and crime and delinquency.

In a speech to the annual conference of the Federation of Associations on the Canadian Environment, Marchand said most Canadians (87 per cent) are ready to change their consumption habits to curb resource waste and to help fight pollution. Three quarters are prepared to pay more for products that pollute less, and 57 per cent are willing to pay more taxes to clean up air and water.

Canadians seem unsure as to which level of government spends the most on environmental protection, but the prevailing view is that neither federal (45 per cent) nor provincial (42 per cent) governments are spending enough.

The survey was conducted for Environment Canada by the Centre de recherche d'opinion publique (CROP). The major objectives of the study were to assess the value Canadians place on their environment and to determine public attitudes on government measures to protect the environment.

Nearly two-thirds (63 per cent) of Canadians surveyed say they are more concerned about the quality of the environment than they were five years ago.

For the longer term, in 10 years or by the year 2000, opinion varies. A comparison of opinions shows greater hope for improvement by the year 2000 (37 per cent) than in the next 10 years (30 per cent).

Among factors contributing to the quality of life, Canadians rank the environment high. In particular, the quality of the air they breathe concerns Canadians the most, (followed by the quality of drinking water, quality of water in rivers and lakes, and opportunity for recreation in fresh air).

Quality of air and water – both for drinking and swimming – concerns Canadians slightly less than the quality of food they eat, and as much as health care and education.

Industries are held responsible, by almost everyone (96 per cent), for cleaning up pollution of air and water caused by their processes. However, the quality of the future environment in the year 2000 will be dependent on early government action, 91 per cent of Canadians feel.

Most Canadians do not equate pollution control with loss of jobs. Fifty-nine per cent see little or no relationship between pollution control regulations which could be imposed on industry and an increase in unemployment.

UNITED STATES OF AMERICA

EPA Changes Ozone Standard

Environmental Protection Agency (EPA) Administrator Douglas M. Costle has announced revision of the Federal ambient air quality standard for ozone, a major part of the urban pollution commonly called 'smog'.

The original standard, set in 1971, was 0.08 parts per million. On 22nd June, 1978, EPA proposed to change the primary standard to 0.10 ppm, and to keep the secondary standard at 0.08 ppm. The latest action changes both the primary health-based standard and the secondary welfare-based standard to 0.12 ppm.

Ozone is not emitted directly into the atmosphere but is produced by a complex series of chemical reactions initiated when hydrocarbon and nitrogen dioxide emissions from autos and other sources are exposed to sunlight.

For further information on the standard contact Mr. Joseph Padgett, Director (MD-12), strategies and Air Standards Division, Office of Air Quality Planning and Standards, US Environmental Protection Agency, Research Triangle Park, NC 27711, or phone (919) 541-5204 (FTS 629-5204).

IUAPPA HEADQUARTERS IN CLEAN AIR ZONE

The International Union of Air Pollution Prevention Associations have just received notice that their premises are now in a smoke control area (Brighton BC Smoke Control Order No. 4). Progress in clean air is still being made! These premises have, however, been run on smokeless fuel since IUAPPA (and the NSCA) have been in occupation.

NATIONAL SOCIETY FOR CLEAN AIR

SCARBOROUGH CONFERENCE 1979

15th-18th October 1979, Spa Theatre, Scarborough

Registrations for the conference and press/media interest shows that the theme of this, the 46th National Clean Air Conference, is of very wide appeal. The subjects are topical, the scope is wide, and whether your concern is with the prediction, monitoring or control of air pollution and noise, you will find that valuable ideas and experience have been gathered together for an outstanding conference at Scarborough. At whatever level your interest is pitched, whether you want advice or are prepared to offer it, you will be able to take part in the discussions and pool your ideas. NSCA conferences are always truly national events and a wide range of experience is represented by both the speakers and the audience.

HAVE YOU REGISTERED YET?

If not, contact: Sue Miles (Brighton 26313)

CORRECTION

In the 2nd April, 1979 issue of *Clean Air,* it was mentioned that the Institute of Energy, formerly the Institute of Fuel, is no longer a subscriber to the Society and we regretted that the Institute had not retained its interest in air pollution abatement and control.

We have now been asked by the Institute of Energy to make it quite clear that the Institute retains a very keen interest in the objectives of the Society although it does not feel it is necessary to express this support in the form of an annual subscription.

The Society apologies for this misinterpretation.

Methods of Calculating, Measuring and Monitoring Air Pollution caused by Electric Power Stations in England and Wales

by

G. W. Barrett

G. W. BARRETT *is with the Planning Department of the Central Electricity Generating Board, London*

1. GENERAL INFORMATION AND REGULATIONS

Emissions to the atmosphere from most of the major UK industries are controlled by the Health and Safety Executive's Alkali and Clean Air Inspectorate. The Inspectorate control those works scheduled under the relevant legislation (1). 'Electricity Works' are scheduled as works in which

(a) solid or liquid fuel is burned to raise steam for the generation of electricity for distribution to the general public or for purposes of public transport; or

(b) boilers having an aggregate maximum continuous rating of not less than 450,000lb of steam per hour and normally fired by solid or liquid fuel are used to produce steam for the generation of electricity for purposes other than those mentioned in the preceding sub-paragraph.

Thus gas fired boilers, diesel generators, gas turbines or auxiliary boiler plant are not controlled by the Inspectorate, but the Inspectorate tends to assume responsibility for all emissions on a registered site and they are consulted over gas turbine stations.

Prior to operation electricity works must obtain a registration certificate from the Inspectorate who will require that emissions to air are controlled in a satisfactory manner. The certificate of registration must be renewed annually. It is an offence to operate an electricity works without a certificate of registration. The Inspectorate may visit an electricity works at any time to ensure that it complies with their requirements.

The requirements of the Inspectorate (2) cover the monitoring and emission of solid particulate matter, the design of chimneys to achieve satisfactory ground level concentrations of gaseous pollutants, the provision of eliminators in cooling towers, operating requirements for coal and oil fired power stations, maintenance of plant, good housekeeping and plant malfunction. The provisions on acid soots have recently been revised.

The requirements set emission limitations for solid particulate matter. They also set limits on the emission of dark smoke. No emission limits are set on gaseous pollutants. Instead the Inspectorate require that the design of the chimney should be adequate to ensure acceptable ground level concentrations of gaseous pollutants. They require adequate insulation to minimise the condensation of acidic gases, a design efflux velocity of not less than 15 m/s at maximum continuous rating and where practicable the use of single, multiflue chimneys.

Electricity works are also required (1) to use 'the best practicable means of preventing the escape of noxious or offensive gases by the exit flue of any apparatus . . . into the atmosphere, and for rendering such gases where discharged harmless and inoffensive'. 'Best practicable means' is usually interpreted as the provision and operation of the best available techniques with due regard for both technical ability and cost.

Other legislation (3-6) also covers the emissions to air from power stations including the ability of the public, under some circumstances, to claim that a nuisance has been committed and to seek redress under common law. In addition one act (5) enables the Secretary of State for Energy to impose limits on the sulphur content of oil fuel used in power stations. Another condition has also been imposed by the Secretary of State which requires adequate provision of space for plant to reduce the sulphur content of emissions.

2. STACK HEIGHT DESIGN

When seeking the approval of the Alkali Inspector for the stack height at a proposed new power station, the CEGB may provide information regarding the effect of the stack on levels of air pollution. That information is based on the following calculation methods.

(a) Plume Rise

Estimation of thermal plume rise is made by the method of Lucas (1967) (7). Momentum rise of the plume is not allowed for separately. Where a more complete description of plume rise is required the method of Moore (1975) (8) is used.

(b) Gaseous Dispersion

Sulphur dioxide is used as an indicator of all gases emitted from a power station chimney. Generally SO2 ground level concentrations are calculated and if necessary allowance made pro-rata for other gases, taking into account changes in emission rates, atmospheric oxidation rates, etc.

It is assumed that for oil fuel all the sulphur is emitted from the chimney. For coal fuel it is assumed that 10 per cent of the sulphur is retained in the ash.

Short term average (three minute) ground level concentrations are calculated using the Sutton (1947) (9) diffusion equations as set out in Lucas (1967) (7). For this case UK average conditions of neutrally stable atmosphere and 6 ms^{-1} wind speed are usually used. Longer term ground level concentrations (hourly to yearly) are calculated by the method of Moore (1976) (10) making allowance for average or varying atmospheric stabilities and topographically induced changes in wind speed profiles.

The methods described above give only instantaneous values for the gaseous ground level concentrations. Recently a method has been introduced which gives a complete statistical description of the power stations contribution to ground level concentrations. The method is based on the empirical observations made around CEGB power stations especially those at Eggborough described by Caunt (11) and exemplified by Figure 1. The statistical patterns shown in Figure 1 can be adjusted, by the methods described above, for any UK power station and for power stations elsewhere provided suitable adjustment is made for different meteorological conditions. The advantage of this method is that it gives a complete description of the effect of the power station under all meteorological conditions encountered. The method has been described in Lethbridge (1978) (12).

(c) Solid Particulate Matter

The Alkali Inspectorate has set out its definition of 'best practicable means' for the control of air pollution from electricity woks (2). For solid particulate matter an emission standard is set of . . .

(i) not more than 0.46 gm^{-3} of total particulate matter for plant of designs agreed prior to 1958;

(ii) 0.115gm^{-3} for plant of designs agreed after 1958.

Reference conditions are 15°C, 1 bar, wet calculated at 12 per cent CO2.

Emissions are also required to be maintained substantially free from visible smoke and not more than Ringelmann 1. When boilers are being brought on load or during soot blowing emissions must not exceed Ringelmann 2.

When calculating the deposition of solid particulate matter around power stations the method of Bosanquet, Carey and Halton (1950) (13) is used. Allowance is made for the appropriate dust size gradings for the type of dust arresting equipment in use.

(d) Topographical Effects

Where the size of topographical effects are small and their initiation is smooth without abrupt changes in land level, allowance can be made within the dispersion equations by consideration of the change of streamlines over the land. Where changes are abrupt or of very large scale it is usual to revert to a model test in a boundary layer wind tunnel. For this a detailed topographical model of 1/1000 scale is usually constructed. The techniques have been described in Robbins (1975) (14). Wind tunnel topographical models are not usually used when the land rise does not exceed two thirds of the chimney height within 1,500 metres of the chimney, provided there are no abrupt changes of land level.

As far as the power station buildings are concerned, since 1932 it has been common practice to ensure freedom from disruption of the air flow and downwash of the plume by building the chimney at least 2.5 times the maximum building height. Calculation of the required chimney height in the presence of very tall buildings is carried out by the method of Lucas (1972) (15). If it is necessary to know the ground level concentration of air pollutants from the chimney in an air flow disrupted by tall buildings then a boundary layer wind tunnel test is usually carried out. The buildings are modelled in detail along with surrounding features to a scale of 1/300. The techniques have been described in Robbins (1975) (14). Robbins has also described boundary layer wind tunnel experiments of notional buildings shapes. These are also used to predict the affect of buildings close to a chimney and to determine chimney heights.

In order to avoid disruption of the plume caused by wind induced turbulence at the chimney top, the chimneys are designed to have a gas exit velocity of 25 ms^{-1} at full load. In order that thermal buoyancy and therefore plume rise should be maximised a single chimney is preferred to many chimneys at each plant. Inconveniences caused by chimney maintenance can be minimised by constructing the single chimney with many internal flues each serving separate boilers. In this case the flues are wrapped in a single concrete windshield. The flues are allowed to protrude beyond the top of the windshield by an amount equal to at least one-third of the windshield diameter. In this way disruption of the plume rise caused by turbulence around the top of the windshield is kept to a minimum.

3. MONITORING AIR POLLUTION AROUND POWER STATIONS

Monitors employed by the CEGB are described in Table 1.

(a) Routine Surveys

Routine surveys are carried out at all new CEGB coal or oil fired power stations when they enter service. The survey usually consists of about 10 monitoring devices set around the power station at places considered to be representative of the area. The aim of the survey is to monitor any change in the ambient air pollution levels due to the power stations introduction. The survey usually extends over a period starting at least

two years before the power station starts operation until at least two years after the power station achieves full output. Only changes in daily or longer term averages are examined. For SO2 monitoring 24 hour bubbler BS1747 (16) monitors or CERL Cummings Redfern (17) monitors are usually employed. For dust deposition BS1747 (16) gauges or CERL directional dust gauges (18) have been employed. There is now a tendency to move away from static monitors to the employment of mobile measuring systems.

The results of some recent routine SO2 surveys were discussed by Clarke et al (19). They found that the effect of the power station on ambient SO2 levels could not be determined from daily or longer averaging time results due to the large statistical fluctuations experienced by such monitors in normal ambient conditions.

(b) Research Surveys

The CEGB has carried out a number of special research surveys around its power stations. The aim of these surveys has been to increase knowledge of the rise and dispersion of atmospheric pollution from power station chimneys. All the instruments in Table 1 have been employed in these surveys but modern research techniques usually require the use of fast response, highly specific instruments. The results of some of these research surveys have been published (11) (20) (21).

A research survey has recently been completed (25) which investigated the acidity and chemical composition of rainfall in areas affected by power stations in the UK. Another survey was recently carried out around Drax power station in Yorkshire. This survey was carried out under the auspices of the Commission of the European Communities and involved 18 teams from six countries. The campaign achieved its objective (26) of comparing different remote air pollution sensing techniques for power station monitoring.

(c) General Ambient Monitoring

A continuous survey of air pollution is carried out in the United Kingdom co-ordinated by the Department of Industry, Warren Spring Laboratory. Currently about 1,200 monitors are in use, nearly all located in urban areas. The monitors mostly employed are BS1747 (16) 24 hour smoke and sulphur dioxide instruments. In addition a smaller number of Lead Dioxide SO2 monitors (16) and BS1747 (16) dust deposition instruments are employed. Many of the monitors used are close to power station sites and the results from the CEGB Routine Surveys are included in the national survey. The results of the national survey are published annually (22). In addition a number of government or local authority sponsored surveys of air pollution are carried out in specific areas (23). A recent survey of an area close to a power station has included the analysis of dust deposition for trace elements using neutron activation analysis (24).

4. RESULTS OF AIR POLLUTION MONITORING AT POWER STATIONS

(a) Sulphur Dioxide

Surveys (Routine and Research) have been carried out around 71 power stations by the CEGB. Lead Dioxide candles have been used at most of these sites but at 16 stations more specific SO2 monitoring instruments have been used, as described above.

Routine surveys have consistently shown the same results. Against a background of nationally decreasing sulphur dioxide ground level concentrations the effects of the power stations have not been discernible by daily or longer term averaging periods.

The CEGB's 2,000 MW coal-fired Eggborough power station in West Riding of Yorkshire.

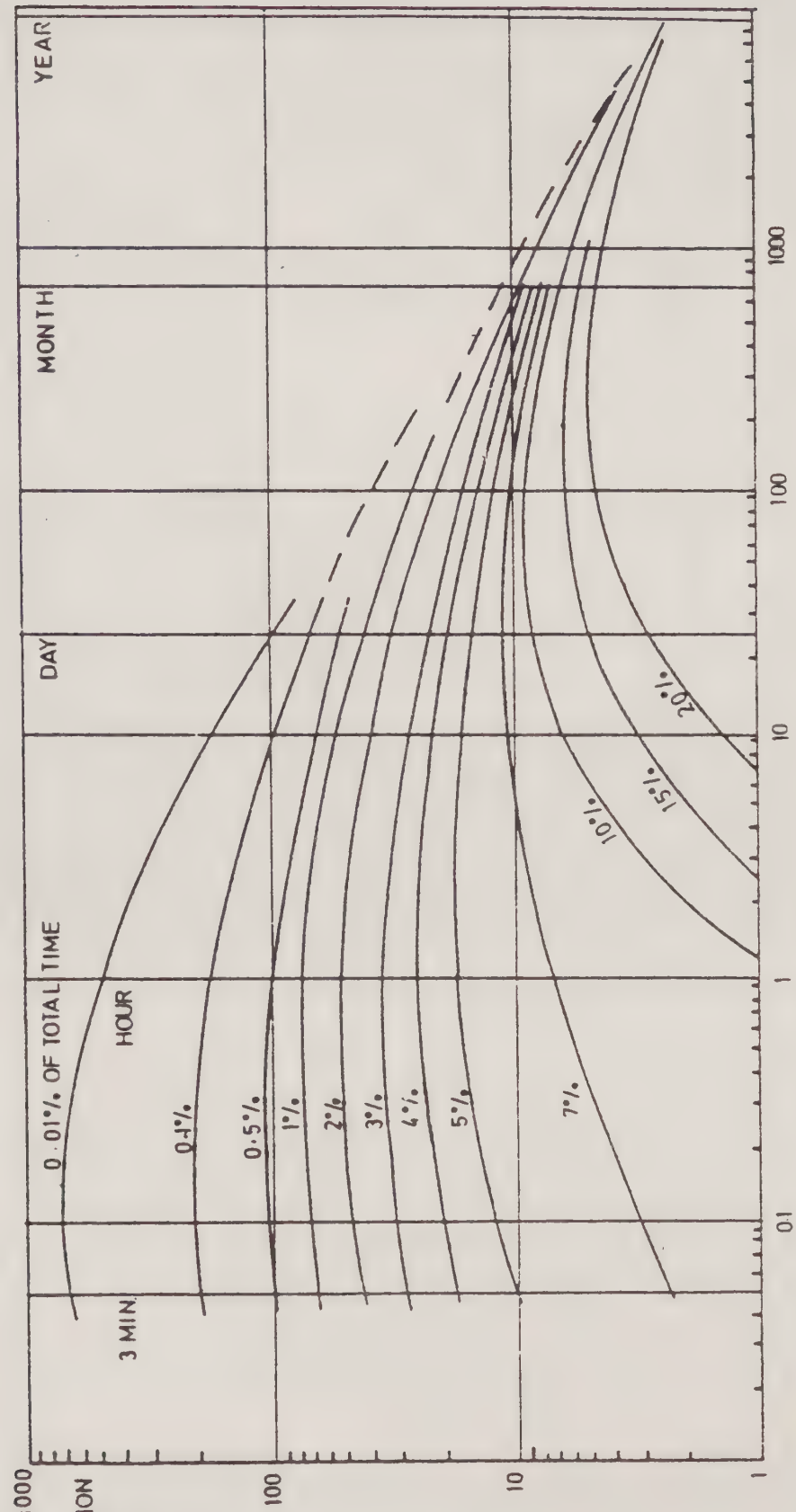


Fig. 1 Frequency with which the given sulphur dioxide concentrations, attributed to the power station alone, were exceeded at Eggborough during 1974/75.

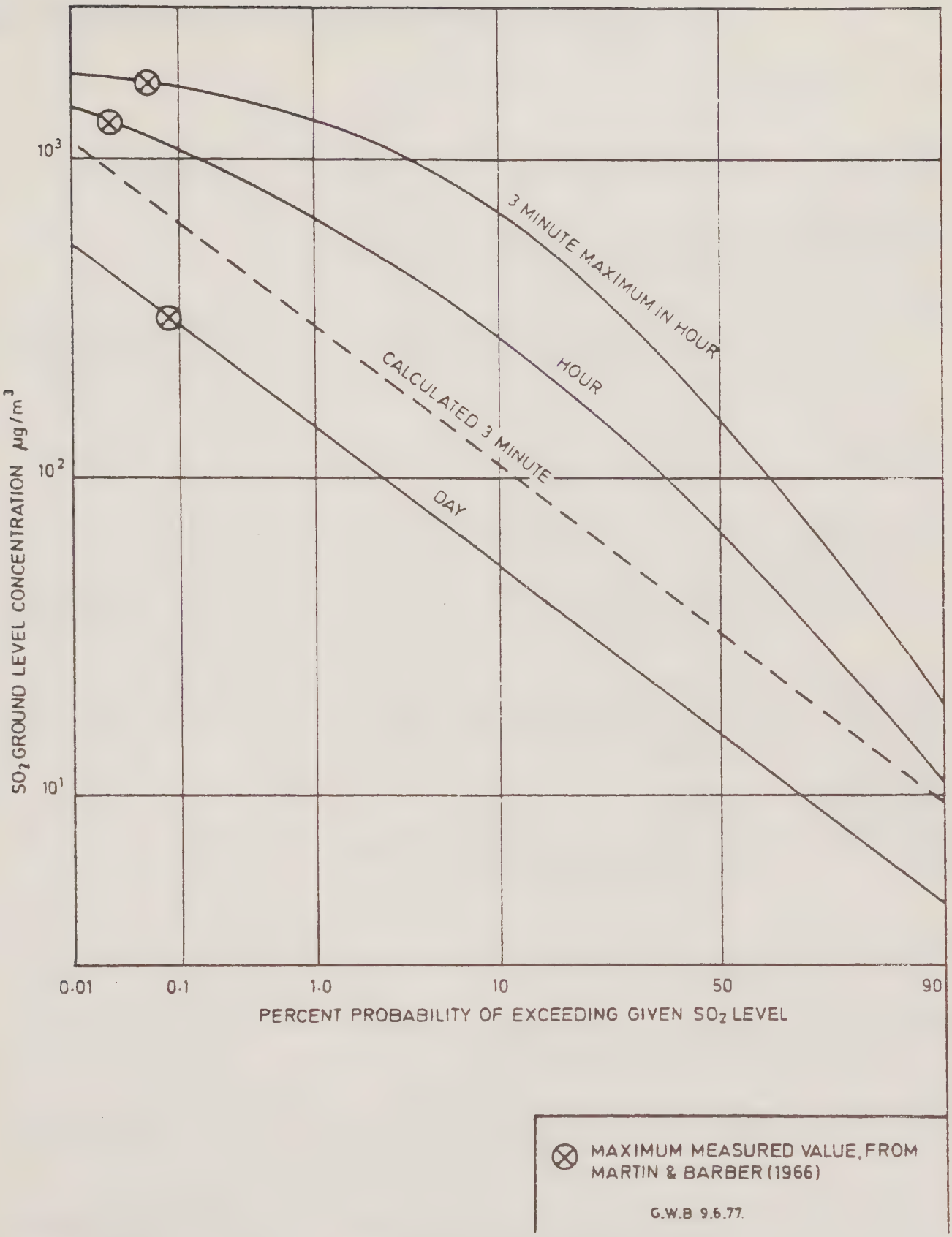


Fig. 2 Measured SO2 concentrations at High Marnham.

AIR POLLUTION MONITORING

Type of Instrument	Principle of Operation	Response Time
SO2 Monitors		
24 hour bubbler developed by WSL	Sample passed through H2O2 which oxidises SO2 H2SO4. Acid determined by titration with alkali	
Meloy SA 185-2	The intensity of the S2 band emission spectra is measured when sulphur species are introduced into a fuel rich hydrogen flame.	17 seconds to achieve 90% of injected value when clean. 90 secs. after some use due to dust ingress.
Meloy 285	Latest model, one of which is at CERL. Same principle as model 185-2.	Believed faster than 185-2.
CERL Cummings Redfearn Recorder	Measures change in electrical conductivity when SO2 reacts with H2O2.	Result is a 3 min. average.
Phillips 9755 (recent model)	Coulometric. SO2 reacts with a halogen in solution. The current required to regenerate the lost halogen is proportional to the SO2 concentration.	About 90 secs. Superior to the earlier model No. 9700.
NOx Monitoring CERL have several models the preferred one being the Monitor Lab. (duplicated channel type). SSDS use the Meloy.	All models are based on chemiluminescence but there are basic differences between different models, e.g. duplicated channels or cycling type. **Principle** NO is first measured, the NO2 is then reduced to NO and the new volume measured. Using the difference between the results the NO2 concentration is obtained.	80 secs. to achieve 90% of true value.
Particulate Monitors		
Standard Dust Gauge	Collection of deposited material in open bowl.	Not fixed but monthly samples usually obtained.
CERL Directional Dust Gauge	Collection of deposited material through a vertical aperture. Four apertures facing at 90° to each other.	Not fixed but monthly samples usually obtained.
ROYCO Dust Monitor (several models)	Light scattering. Monitors number of particulates per ml of air. The most expensive model will give the numbers of particles in each of several size ranges.	Samples continuously over a programmed period of time.
The Gelman Hawksley High Volume Sampler	The air sample is drawn through a cascade impactor followed by a back-up filter at 20 cfm. Results in mg/m^3 over about five sizes ranges.	Sample taken over a period of up to about a day. Unlike the Royco the dust collected can be analysed.

INSTRUMENTS IN CURRENT USE 1978

Stationary or Mobile	British Standards Number	Substances Monitored and Sensitivity
Static	1747	The result gives the net acidity of the sample expressed as (SO2) averaged over 24 hours.
If operating mobile care is required to prevent contamination by vehicle exhausts.		Total sulphur in the sample. Can be made specific to SO2 by insertion of filters. Can be modified to measure particulate and gaseous S separately, at extra cost. Sensitive to 7μg SO2/m^3.
As for model 185-2.		Sensitive to 1μg SO2/m^3. As for model 185-2.
Static		Net acidity. Now obsolete but used by NER for surveys.
Unsuitable for mobile use on roads. Modified version can be used in aircraft.		A large number of substances interfere but are prevented from doing so by using filters or buffering the solution.
Some models will operate mobile others give trouble.	British Standard is in preparation?	CO, SO2 and water interfere but the effects can largely be overcome.
Stationary	1747 Part I	Weight of total deposited particulate minus substances leached out by rain.
Stationary	1747 Part V	Weight of particulate matter passing through vertical aperture minus substances leached out by rain.
Both	None	All particulates down to 0.5μm.
Stationary	Probably None	All particulates down to a very small size.

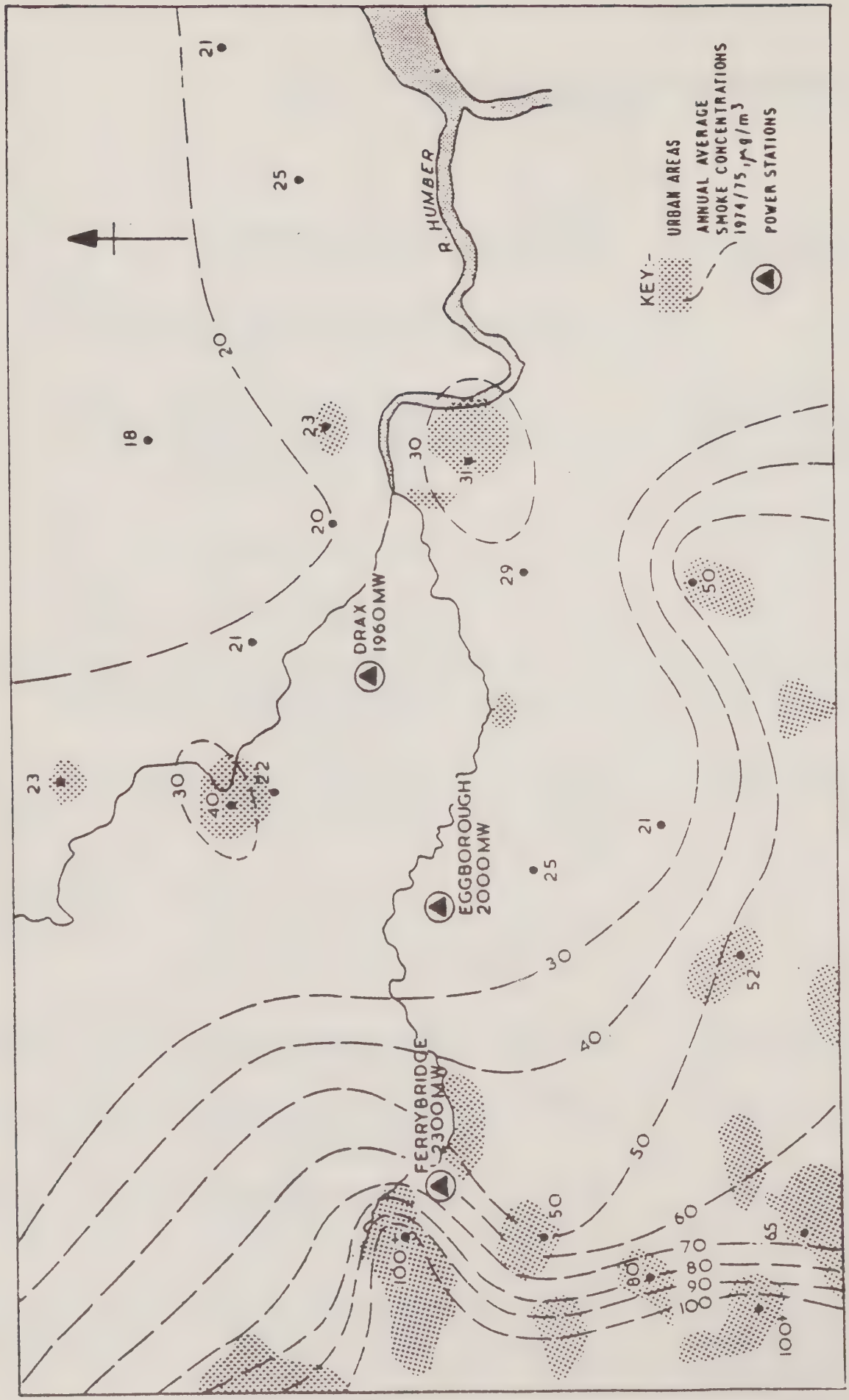


Fig. 3 Distribution of smoke and power stations in Yorkshire.

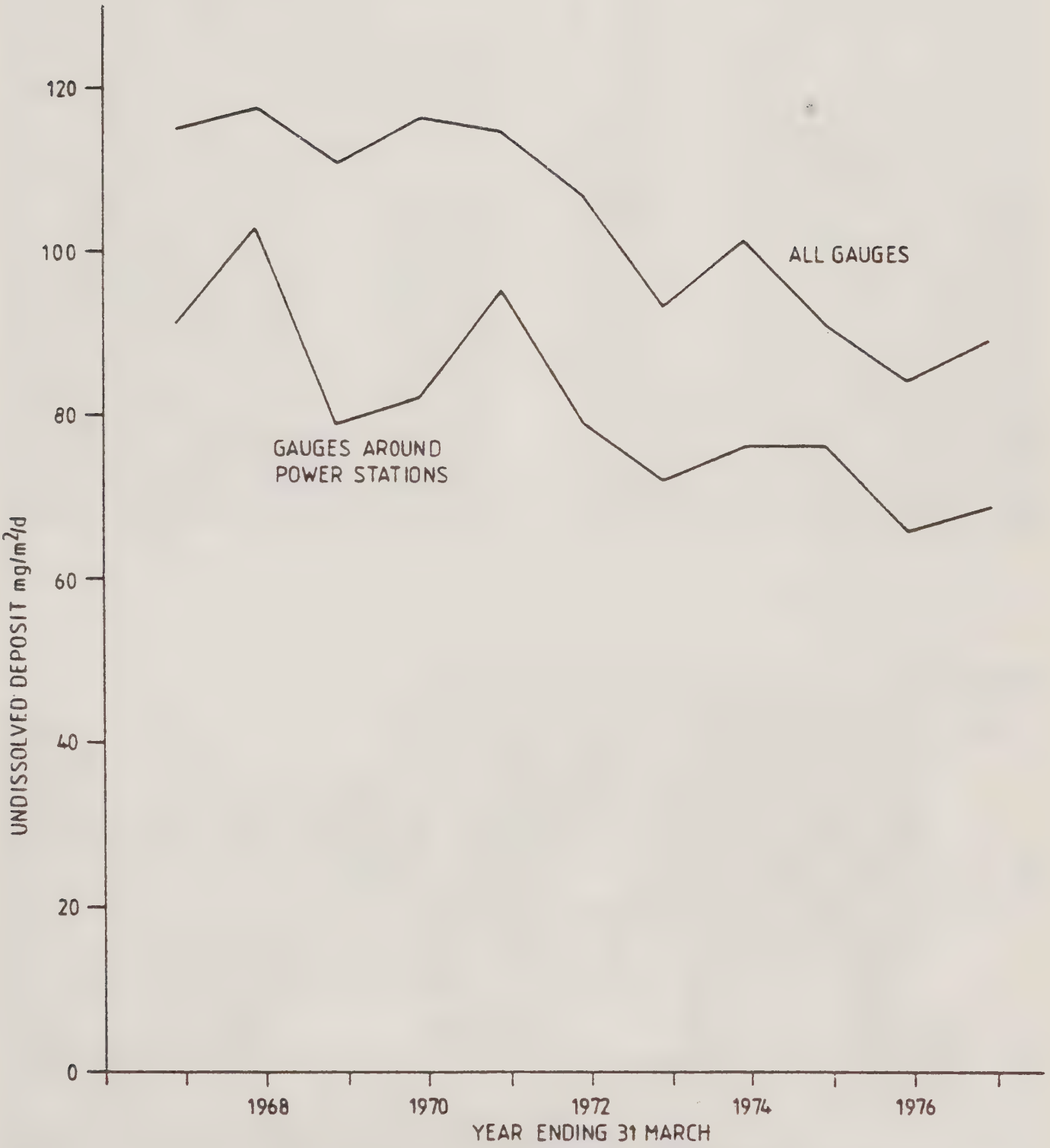
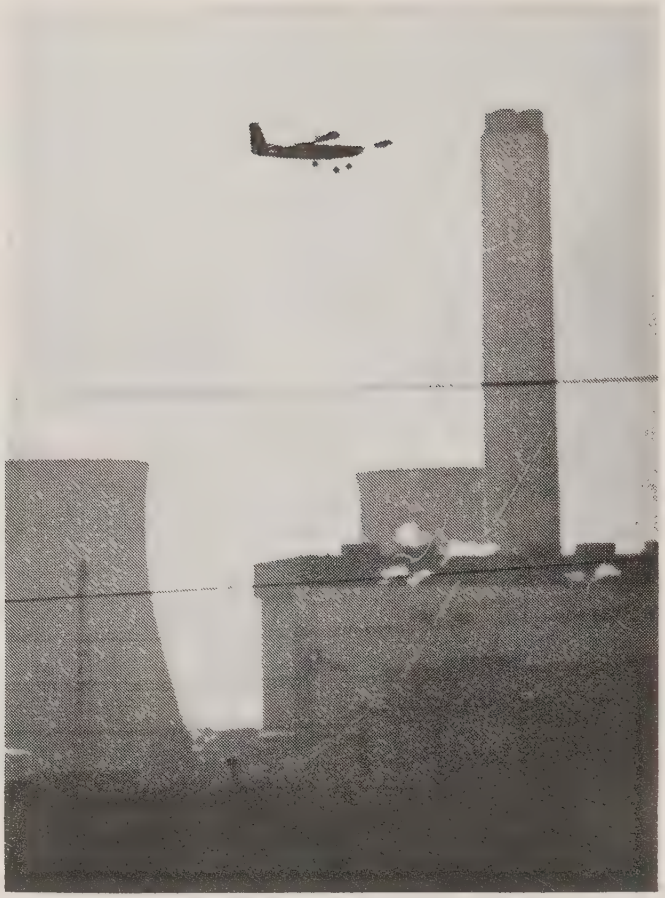
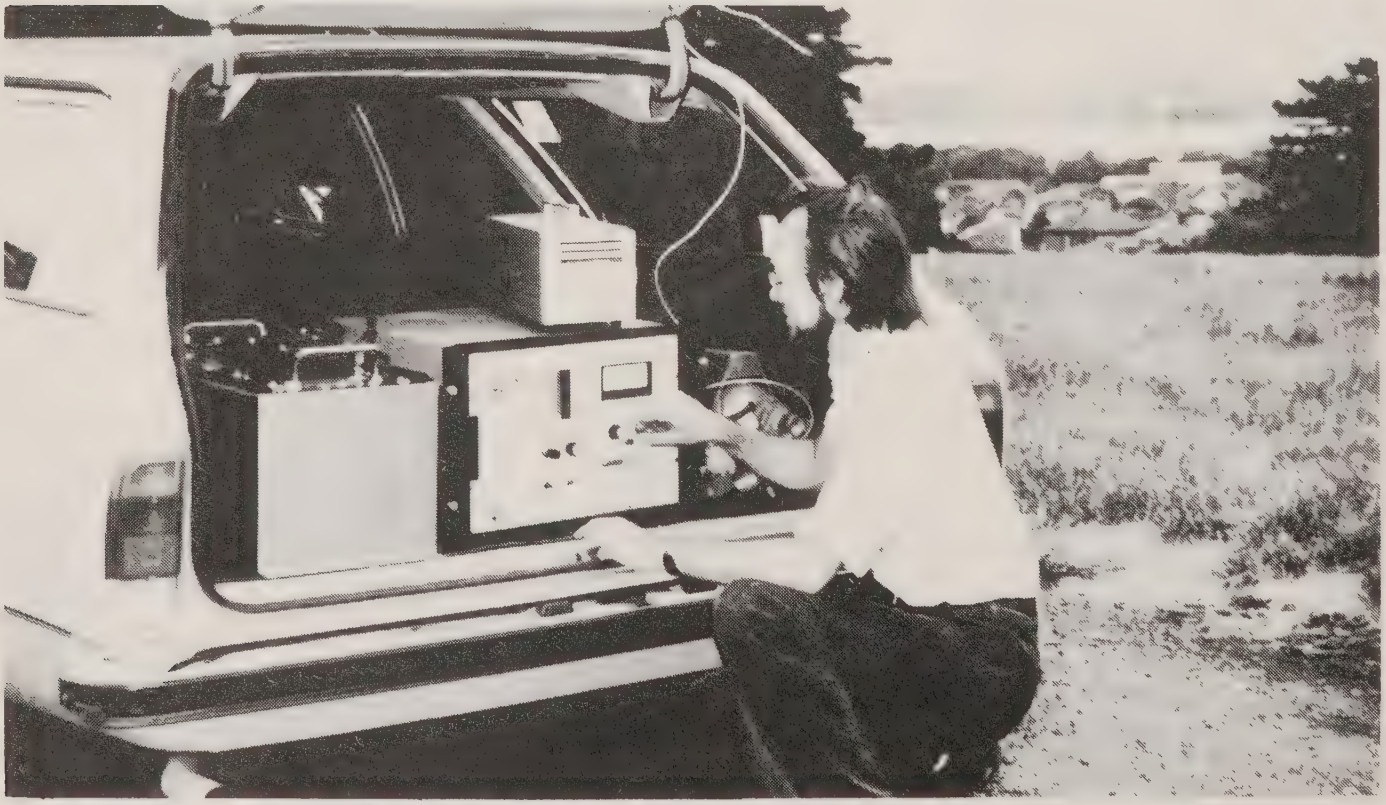


Fig. 4 Deposit gauge results.

Routine SO2 survey using BS.1747 bubblers



Radio-controlled model aircraft sampling gases in chimney plume .



Mobile method of SO2 measurement as employed in research surveys.

The inability of the routine surveys to detect the power station contribution lies in the statistical variation of the day to day measurements. Statistical analyses at Fawley and Pembroke (19) revealed that the averaging method used would have distinguished differences of 7 and 17 $u gm^{-3}$ respectively if they had been produced by the power station. These upper limits to the power station contribution have been supported by the results of the research surveys.

Research surveys have been carried out at five power stations, but only at two have the practical measurements received the greatest stress. The others being used mainly to provide data for dispersion modelling, etc. Results from the two surveys at High Marnham and Eggborough are shown in Figures 1 and 2. They represent the ground level concentrations averaged over the gauges set around the station at the position where the maximum effects would be predicted. The High Marnham results (27) can be regarded as typical for what might now be regarded as an older type power station (930 MWso, 2 x 137m chimneys) while the Eggborough results (11) represent modern practice (1720 MWso, 1 x 198m chimney).

In the period measured (1974/5) Eggborough gave an average annual SO2 ground level concentration of 2.5 $u gm^{-3}$, the summer average being 3 $u m^{-3}$. These results conform well with the upper limits of 7 $u gm^{-3}$ given by Pembroke.

Special surveys may be carried out around or near power stations from time to time. One notable survey was that made at Battersea (28) to test the effect of closure of the gas washing system. The report was produced jointly with the GLC and Warren Spring laboratory. It concluded that the power station with gas washing suspended, gave no noticeable effect on daily, monthly or peak daily SO2 levels or on the number of days with SO2 $>$ 500 $u gm^{-3}$. However increases of $<$30 $u gm^{-3}$ daily would not have been detectable. In gusty weather very short term (30 second averaging time) peaks of up to 3,988 $u gm^{-3}$ were observed at one site in the upper storeys of a block of flats. These short lived peaks occasionally recurred over periods of a few hours. These peaks if attributable to the power station would have given an upper limit to the annual power station contribution of 10-20 $u gm^{-3}$. Battersea is a very old power station (245 MWso, 2 x 103m chimneys).

(b) Other Gases

No detailed surveys of ground level concentrations of other gases have been carried out by the CEGB. Ad hoc investigations specially of NOx have been made. SO2 is usually regarded as an indicator of all gaseous emissions and ground level concentrations of other gases calculated from operating conditions and the SO2 measurements by the methods described in earlier sections of this paper.

(c) Solid Particulate Matter

Measurements of solid particulate matter around power stations have been carried out at the 71 power stations surveyed by the CEGB. Measurements have been made in three major ways.

(1) Total undissolved deposited matter by BS1747(I). Particulates falling into a bowl with horizontal mouth are collected (usually monthly) and weighed. Rainwear also enters the bowl thus the particulate weighed is that left undissolved. Gross detrital material such as leaves and insects are not normally included.

(2) Total undissolved deposited matter by directional dust gauge BS1747(V). Particulates falling into a collector through a vertical aperture are collected. Four collectors mounted at 90° give an indication of the directivity of the result. The gauges are partially filled with phenol to stop mould growth. Some rain enters but not as much with the BS1747(I) gauge. Dust is usually washed out of the gauge. The matter weighed is therefore undissolved matter. These gauges are generally less effected by re-entrainment in wind than the BS1747(I) gauges but still suffer from sizing separation due to aerodynamic effects.

(3) Smoke is measured by the method of BS1747 (2). Samples are usually taken daily. They consist of a measurement of the reflectivity of a filter through which a measured volume of air has passed. Light coloured particles (such as pfa) which have adhered to the filter do not give as high a reading as dark particles. The reflectivity of the filter paper is converted into an air concentration of black smoke which would be expected to give the same reflectivity. The collection mouth of the equipment is an inverted funnel with horizontal aperture.

Daily smoke levels throughout the UK are declining. The survey around Didcot power station did not show any effect directly attributable to the power station (29). This may be due to an inability to detect a small contribution, as in the case of SO2, or to the fact that power station ash does not register strongly on an instrument designed to record black smoke. An examination of smoke levels around Drax (1875 MWso, 1 x 260m chimney), Eggborough and Ferrybridge (2214 MWso, 1 x 130m + 2 x 199m) show no effects on annual contours of smoke levels that can be attributable to the power stations. This area represents one of the highest concentrations of electricity generation in Europe. See Figure 3.

Dustfall measurements at Didcot, Ratcliffe and High Marnham have been reported (29, 30). At Didcot deposition rates of undissolved matter showed a substantial reduction between 1966 and 1977, the period when the power station commenced operation, no effect due to the power station could be determined. At Ratcliffe the deposition rates showed no significant changes over 13 summers and since the power station was commissioned. At one site however winter levels of deposition increased and this could partly be attributable to the station. At Didcot, Ratcliffe and High Marnham deposition rates in summer were generally greater than those in the winter.

At Ratcliffe and High Marnham the dustfall collected was analysed microscopically for the presence of power station ash, contributions varied considerably. At Ratcliffe the proportion of cenospheres was significantly correlated with the station output in both summer and winter periods and at the worst affected site the power station was estimated to contribute 10 ± 4 per cent of the total yearly dustfall of 50-100mg/m²/day.

Dustfall trends around several power stations are shown in Figure 4. Trends for all CEGB gauges between 1967 and 1975 show on average a steady decline from 95 to 75mg/m²/day.

Directional dust gauges at Didcot showed that the gauge facing the power station collected more dust than similarly oriented gauges at three other sites, in relation to the precommissioning period. The percentage increase attributable to the power station varied from —2.7 per cent to +12.3 per cent. It was concluded that the directional gauges enabled the effect of the power station to be detected. This was estimated to amount to a few per cent of the overall dust pollution.

5. CONCLUSIONS

The CEGB has mounted a considerable air pollution research and monitoring effort around its power stations. This work has revealed the following:

1. Instruments covered in BS1747 have given good service and are suitable for monitoring the trends in air pollution around power stations. Due to the high level of fluctuations experienced in these measurements, they cannot be used to define precisely the effect of the power station on air pollution concentrations at ground level.
2. Instruments with an averaging time of 3 minutes or less have defined the contribution of power stations to sulphur dioxide levels at ground level. The results can be analysed to show the probability of exceeding different SO2 levels for different averaging times. A large modern power station can be expected to contribute at most 3 $u gm^{-3}$ to the annual average SO2 ground level concentration in its area.
3. Examination of the proportion of cenospheres collected in dust deposition gauges suggests an upper limit of about 10 per cent addition from power stations to dust deposition levels in semi-rural areas.
4. The results for dust deposition have been confirmed by the use of directional dust gauges which suggest an addition of a few per cent due to the power station.
5. In future monitoring air pollution levels around power stations will probably be accomplished by mobile apparatus with fast response.
6. Monitoring results conform well with theoretical predictions made at the design stage.

6. ACKNOWLEDGEMENT

This paper is published by permission of the Central Electricity Generating Board.

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POLLUTION ABSTRACTS

119. The Spoiling of America. Clive Cookson. *New Scientist* Vol. 82, No. 1160, 21st June 1979, pp.1015-1017.

Recently, the United States has discovered yet another environmental crisis: the leakage of toxic chemicals from industrial dumps. Last summer scarcely anyone even in the environmental movement, was aware of the problem. Then details of the pollution nightmare at Love Canal, near Niagara Falls, were publicised throughout the country and journalists began to tell scores of similar stores about 'ground pollution'. The House of Representatives Investigation Sub-Committee have been told that dumping disasters 'have inflicted untold human suffering and millions of dollars of property damage' in many States. It will cost America $6 billion to stop existing dumps deteriorating and colossal $44 billion to clean-up the nest that US industry has fouled so obscenely. Unfortunately the US Government and private industry have been doing very little research into the disposal of hazardous waste, so there is little hope that an imminent technical or scientific break-through will alleviate the problem in the near future. Whatever the United States does to improve the future disposal of industrial waste, it cannot defuse all the chemical time bombs buried over past decades.

120. Living on a Knife-edge - The Aftermath of Harrisburg. Peter Bunyard. *The Ecologist* Vol. 9, No. 3, June, 1979, pp.97-102.

The nuclear accident at Three Mile Island may not have been the worst reactor accident ever. But times have changed, and today, people want to know what is happening, and they want the truth. Those investigating the course of events at Harrisburg, and the extent of damage both inside and outside the reactor, will have to decide how close Three Mile Island was to major disaster. The investigation will hardly be made easier by the extremely high levels of radiation now to be found inside the reactor vessel and inside the containment dome. If the investigators discover and publicly admit their discovery, that the reactor was within a hairs-breadth of an explosion or a complete core melt-down, it will surely raise soul-searching questions about the implications of continuing with such Light Water Reactors in the United States.

121. Heseltine on the Environment. *Environmental Data Services (ENDS)* Report No. 27, June, 1979, pp.10-13.

Mr. Michael Heseltine (Secretary of State for the Environment) recently gave a speech summarising his stance on nuclear power, the Vale of Belvoir enquiry, environmental impact analysis, energy conservation, recycling, nature conservation, derelict land and environmental research. A major portion of that speech is reported in this article, which highlights some of the issues worth watching as the new Parliament gets into its stride.

122. Water Noise in Large Cooling Tower Installations. A. M. Kunesch, *Noise Control.* Vol. 10, No. 4, April, 1979, pp.

Large cooling towers are frequently found in the plant complexes of chemical and power generation industries. For the larger cooling towers, even when fans are fitted, the overall noise level in the vicinity of the tower is likely to be dominated by the impact noise of the water on the packing within the air inlet and finally, on the surface of the pond itself. In the case of small cooling towers, the prediction of noise intensity at a distance in excess of around 30-50 metres can be taken as a hemispherical radiation through a point source. However, with the large multi-cell mechanical draught cooling

tower or natural draft cooling tower, the noise is radiating from a considerable area. The UK Atomic Energy Authority was concerned about the noise level from the cooling tower installation at Winfrith Heath affecting private residences some 270-290 metres from the centre point of the installation. The Authority stated in its specification that noise should if possible be no more than 40 dBA at a boundary of some 260 metres from the centre point, and a number of design features were incorporated in the final scheme to minimise the risk of fan noise with its attendant discrete frequencies from causing a nuisance. For the average chemical plant complex, general noise from the plant could easily swamp that from the cooling tower, due to the presence of pumps, compressors and other noise sources generating discrete frequencies. However, the contribution of the cooling tower, with its large radiating area, should not be overlooked in the estimation of the overall noise level generated within a works complex.

OBITUARIES

WILFRED COMBEY

It is with regret that we have to report the death of Wilfred Combey on 20th June, 1979, at the age of 72 years, at his home in Kennington, Oxford. Wilf Combey was the former Chief Public Health Inspector to the Oxford County Borough Council until his retirement in 1971, a post he held for over 21 years, and he will be particularly remembered for his work in the City on smoke control and the Jericho housing gradual renewal programme which gained national fame.

He began his career at South Shields in 1921 and moved to Lancaster and Wembley before being appointed Chief Inspector at Gosforth in 1938. He became Deputy Chief Inspector to Newcastle-upon-Tyne in 1946 and he came to Oxford in 1950. On retirement he had completed 50 years and six months in Local Government service.

Throughout his long service Wilf had been an enthusiastic and tireless worker, both in his professional career and for the Environmental Health Officers Association and the Society (formerly the Guild) of Environmental Health Officers. He was presented with a Certificate of 50 years Membership earlier this year. He had served as President and Chairman of the Northern and Southern Centres and of Branches of the Association and was a General Councillor from 1965-69, and was a life Fellow. He was President of the Guild in 1962 and Chairman of the Salaries and Service Conditions Committee for several years.

In 1974 he was Chairman of the Council of the National Society for Clean Air and for 10 years was Chairman of the Central Southern Division of the Society. He was a member of the Council of the Institute of Public Health Engineers and a life Member of the Royal Society of Health.

He presented a number of papers to various Conferences of the Association, Royal Society of Health and National Society for Clean Air on a variety of subjects, including housing conditions, pollution control, clean air measures, dry cleaning hazards, food hygiene, and pest control. In addition to his ever enquiring interest in these subjects, he was an accomplished musician, playing the organ and the piano, and he enjoyed singing, both as a soloist and in the choir of the Methodist Church. Since his retirement he had enjoyed painting in oils.

The funeral service, held at the Wesley Memorial Church, Oxford, was attended by many former colleagues, members of the Oxford City Council, and representatives of the Centre and Branches of the Association.

Our deepest sympathy is extended to Mrs. Combey and his son and daughter at this sad time.

FRANCIS L. WARING

With the death of Francis Waring, CBE, SFInstF, on 30th May at the age of 80, the solid fuel and chemical industries have lost one of their best loved characters.

Throughout his personal and business affairs, he displayed a most remarkable combination of unswerving integrity, good-humour, shrewdness and morality, with an endless concern for the well-being of other people.

On leaving Barnsley Grammar School in 1915, he joined Coalite and Chemical Products (Barnsley Smokeless Fuel Company as it was then) and has remained very closely involved in the affairs of that Company, serving on the Board until his death. When he joined Coalite as a boy, the foundations were being laid for the first works ever to produce 'Coalite' smokeless fuel on a commercial scale, near Barnsley. He became Manager of that Works in 1929 and then successively General Manager, Director, Managing Director and then Chairman from 1971 to 1975, since when he has retained active interest as a non-executive Director.

Over that period, the Company has grown into the large and successful Coalite Group, having now a turnover approaching £300m, and much of that remarkable progress is attributable to the untiring persistence, commonsense and business ability of Francis Waring.

His active support of trade organisations is reflected in the prominent offices he held at national level at different times, including Membership of Council of the Institute of Fuel, President of the Association of Tar Distillers, President of the Chemical Industries Association, Member of the Domestic Consumers' Council, Director of the Coal Trade Benevolent Association and numerous others. In 1974, he was made a Commander of the Most Excellent Order of the British Empire in recognition of a life-time of service to others.

To know him was to admire him and to be his friend a privilege shared by many.

C. E. Needham

NEWS FROM THE DIVISIONS

EAST MIDLANDS DIVISION

Buxton, the scene of the Annual General Meeting on Thursday, 21st June, 1979, will be known by name to readers if not by experience. For those who have never visited this Spa, set in the High Peak of Derbyshire, a passing note not to miss any opportunity that may arise is certainly called for.

The appearance, on the approach to Buxton, of the local quarries and lime works, are a reminder that the High Peak has problems punctuating its green expanse. Later, in the Pavilion – a majestic glass-domed building with an arresting sense of spaciousness inside, and set in gardens which impart an abiding sense of tranquility – the Mayor of High Peak Councillor G. A. Bingham, extending a Civic Welcome to members of the Division, pointed out that the residents of High Peak needed industry and the Council also needed to make provision for the large number of visitors to the area, whilst at the same time ensuring that the natural beauty was preserved. Cllr. Bingham said that in High Peak they were proud of the Pavilion Gardens, which made an ideal setting and he felt that Buxton would make a very suitable venue for an Annual Conference.

Opening the business meeting, Cllr. Mrs. E. M. Tomlinson, JP, also of High Peak Borough Council, first received apologies for absence. These included Mr. T. Henry Turner. The meeting requested that a letter be sent to Mr. Turner expressing appreciation of his services over the years.

After receiving the Secretary's report and the audited financial statement, the meeting turned to the appointment of Officers. Cllr. Mrs. Tomlinson, in handing over to Mr. J. B. Brackenbury, FEHA, the Chief Environmental Health Officer of the Borough of Chesterfield, said her year of office had been less fulfilling than it might have been, due to an operation which had affected her mobility and then when she might have ventured out, the High Peak area was snowbound. Mrs. Tomlinson referred to the progress with Smoke Control in High Peak and the advances being made with industrial problems including the laying of a gas main to a lime burning kiln which should enable smoke problems to be cured by 1981. Mrs. Tomlinson also referred to Mr. T. Henry Turner

commenting that we had all appreciated his charm, good humour, kindness and helpful nature and would all want to wish him well as he took things a bit easier. Mrs. Tomlinson also offered congratulations to Mr. D. F. Haynes on becoming a Member of Parliament and said that Mr. Haynes had promised to further the aims of the Society whenever possible. Installing Mr. Brackenbury, Mrs. Tomlinson said that his involvement in Environmental Health went far beyond his position as Chief Environmental Health Officer of Chesterfield and she wished him a rewarding year in office.

Mr. Brackenbury, taking the Chair said that he regarded his election as an honour for his authority as well as for himself. Chesterfield had been almost continuously represented since the Division was formed on 7th April, 1949 and his predecessor as Chief Officer at Chesterfield, Mr. George Drabble, had been Secretary for a number of years. Mr. Brackenbury emphasised the need for the Society and said that problems of air pollution continued to call for vigilance. He hoped that despite financial restraints all represented would do everything possible to maintain support for the Society

Following the business, the meeting was addressed by Dr. J. Allardice, Medical Adviser to the Turner Newall Group of Companies who traced the history of Asbestos from 2500 BC and the growing awareness of the risks involved in its use which had become increasingly documented over the past 50 years. Dr. Allardice went on to describe the uses of asbestos and indicated the people who were considered to be at risk. He then dealt with the diseases which were attributed to the use of asbestos and the means of preventing them, including monitoring and the search for substitutes. At the end of the talk, Dr. Allardice answered questions and was suitably thanked by the Chairman.

At the conclusion of the meeting a warm vote of thanks was accorded to the High Peak Borough Council at whose kind invitation, members then partook of an excellent buffet lunch before setting out for the works of Ferodo Ltd., some six miles further north at Chapel en le Frith.

At the Ferodo Works, members were met by Mr. Frank Carter the Chief Executive, Mr. I. D. Hedley the Safety and Environmental Control Manager and the firm's Chief Engineer.

Mr. Carter said Ferodo were ready to meet the Standards of the Simpson Committee. Substitutes for asbestos were being looked for but 80 years of development were not easy to replace and there was need to guard against finding a repetition of the problem in years to come with alternative substances. Ferodo manufactured safety products and were safety conscious themselves. The Company's Chief Engineer then outlined the processes carried on and the very stringent precautions taken with dust involving 38 dust plants containing bag filtration systems with a design efficiency in excess of 99 per cent. The majority of the members then toured the factory and saw all the various steps in the manufacture of brake linings as well as the dust collection and arrestment installations, whilst a smaller group remained to see the processes described on film.

The thanks of the Division are indeed very much due to the High Peak Borough Council and to the Ferodo Company for a most interesting and informative day.

E. F. Raven,
Hon. Secretary

NORTHERN DIVISION

The Annual Meeting of the Northern Division was held at the Civic Centre, Newcastle upon Tyne, on Monday, 25th June when 47 members attended.

Councillor L. Poole, BEM, JP, was re-elected Chairman and welcomed the speaker, Admiral Sharp, Secretary General, on what would probably be his last visit to the Division before his retirement.

Admiral Sharp gave a detailed review of the past, current and future activities of the Society commencing with his appointment at the beginning of 1968. He stressed that the views he expressed were personal and not in all cases necessarily the official opinion of the Society.

Amongst the numerous points made by the Admiral was the need for the Society to continue to press laggard local authorities to proceed with smoke control until all urban areas of the country were covered by smoke control orders. There was an urgent need for a national energy policy, highlighted at the moment by the shortage and rapidly rising price of oil. Levels of sulphur dioxide in some authorities were giving rise to concern, particularly in view of the concentrations that the EEC were prepared to introduce as a standard. The City of London had brought in controls over the sulphur content of liquid fuels limiting it to a maximum of 1 per cent and some London boroughs had shown an interest in copying this example, but the situation was complicated as the oil companies' view was that if the whole of London had this type of control it would need all available supplies of low sulphur oil to satisfy this demand and, in consequence, there would be none left for the remainder of the country.

Looking to the future, the Secretary General saw no need for despondency. The shortage of oil may compel the withdrawal of diesel locomotion, but this could be overcome by electrification of the railways, the energy being supplied by nuclear generated power. He believed the country needed nuclear power in the future and the Society should be prepared to play its part in facing up to the problems this presented, particularly in finding acceptable methods of disposing of the waste.

On road traffic, the Admiral believed that there was a real problem with noise. He thought that the Society should expand its interests into the field of noise as this was simply another form of pollution and towards this end moves were afoot to change the name of the Society so that this wider interest in various aspects of pollution was more apparent.

The minor items of business dealt with at the meeting were (a) grants towards the cost of installing fans to underdraught fires in smoke control areas, (b) the quantity of bituminous coal sold by corner shops, and (c) the Joint Clean Air Committee for the North East.

C. R. Cresswell,
Hon. Secretary

MR. PHILIP DRAPER, C.Eng., F.I.Mech.E., F.Inst.E.

It is with deep regret that we have to announce the death of Mr. Philip Draper, Member of the Society's Council and a former Chairman of Council. Mr. Draper died unexpectedly at home on Thursday, 16th August. A funeral service was held at the Church of Lady St. Mary, Wareham, on 23rd August and the Society was represented at the service by the Secretary General. Mr. Draper gave unstintingly of his time and experience in the cause of clean air, and his contribution to the work of the Society has been great. Our sympathy is extended to his widow and family at this sad time.

An appreciation will appear in the next, No. 5, issue of *Clean Air*.

INDUSTRIAL NEWS

GUIDELINES FOR ASSESSING INDUSTRIAL ENVIRONMENTAL IMPACT

There was a time when the promotion of industrial and other types of development was given such priority that there was no regard for the adverse consequences of development, whether pollution, cultural change or resource depletion. These effects could, it was hoped, be attended to once the project was in operation. Pollution control and other mitigating measures would be paid for by the wealth generated by the development.

This is no longer the policy which is acceptable or adopted in most industrial countries. Sophisticated planning and pollution control regulations are now well established. Increasingly, procedures such as those used in environmental impact assessments are employed to select appropriate sites and processes for development projects. These environmental assessments involve the orderly study and analysis of the overall impact of planned or existing developments in terms of both physical and socio-economic effects. The objective of the assessments is to facilitate an efficient deployment of specialist environmental expertise by adopting an integrated and multi-disciplinary approach.

The less developed countries too are now increasingly concerned with the potentially adverse impacts of industrial and other projects. They are very interested in methods which can assist in avoiding or mitigating these impacts. It was therefore logical that, as a result of requests from individual countries, the Governing Council of the United Nations Environment Programme (UNEP) recently requested the UNEP Industry Office to prepare practical recommendations and criteria for assessing the environmental impacts of industry. The Industry Office in turn asked Atkins Research and Development to prepare guidelines on this subject.

Atkins Research and Development's draft report on guidelines for assessing industrial environmental impact and the siting of industry has recently been submitted to UNEP for review prior to publication. The guidelines will then be the subject of regional workshops in Africa, South America and Asia. It is anticipated that the guidelines will be of considerable assistance to UNEP in enabling the organisation to meet its objective of facilitating environmentally appropriate industrial development.

The guidelines urge that environmental assessment be employed at an early stage in the planning of developments when decisions regarding appropriate siting and processes are made. Too often, environmental considerations are found to be excluded from decision making until such time as rivers are polluted, the atmosphere becomes unpleasant or even dangerous to breathe, local opposition delays the start of operations, or it is found that the labour force is difficult to recruit or train. Inclusion of environmental studies at the feasibility stage of development along with technical and financial considerations is seen as essential in order to allow a comparison of the likely effects of alternative proposals to be made.

The preparation of the guidelines involved three principal interconnected areas; first, methodological and administrative aspects, second, guidelines for assessing physical environmental impact, and, third, guidelines concerned with the socio-economic effects

of development. The methodological chapter sets out how to progressively introduce environmental considerations into the planning and development process. The chapter dealing with ecology and pollution concentrates on appropriate techniques, criteria and some examples of standards adopted in various countries. The socio-economic chapter is concerned both with the human consequences of pollution and ecological disruption and with the wider socio-economic impact of development, including some discussion of urbanisation and infrastructure considerations.

Throughout, the objective was the production of a practical working document for use both by those charged with the responsibility for establishing and administering environmental assessment procedures and by those involved in particular projects, whether as project managers or as specialist physical and social scientists. It is intended that the guidelines will have general applicability to a wide range of countries at different stages of industrial and economic development.
Reader Enquiry Service No. **7943**

Nuclear Power – Your Choice

What are your views on the future of Nuclear Power? Have Harrisburg and Windscale made you think again? The public debate on this vital issue is open to everyone but do you feel you have enough knowledge to form a valid opinion?

A trio of tape/slide sets entitled simply 'Nuclear Power' has been released recently by Diana Wyllie Ltd. of 3 Park Road, Baker Street, London NW1. Devised by Dr. Michael Flood, Energy Consultant to Friends of the Earth, they provide a much needed guide to a better understanding of the main issues involved in the vitally important discussion on our nuclear future:

Should Britain build more power stations? What is the future of the fast breeder reactor? Can the international problem of radio active waste disposal be solved? Do the probable benefits outweigh the possible hazards? Is it our duty to consider posterity's heritage?

This is the first time that so much information on all angles of these crucial questions has been presented in such a comprehensive but easily digestible form. The three half-hour tape cassettes, three sets of colour slides with 48 pictures in each, assembled from all over the world, and the three full booklets of more technical notes will make a valuable contribution towards enabling lay people to take a more effective part in discussing the momentous issues at stake.

Details from Diana Wyllie Ltd., 3 Park Road, Baker Street, London NW1 6XP. Telephone: 01-723 7333.

Reader Enquiry Service No. **7944**

Coal Prices Rise

The National Coal Board increased the price of industrial, carbonisation and domestic coals on1st July, 1979. The price of smokeless fuels produced or manufactured by the Board also rose.

The amount of the increase varies for individual qualities and coalfields. The average rise in each of the above categories falls between £2 and £3 per tonne although price increases for some individual coals are outside this range. These increases are on pit and plants prices. In addition to the increase in NCB prices of domesic fuels to merchants, there have been recent increases in transport and distributive costs which merchants may need to reflect in their retail prices at the same time.

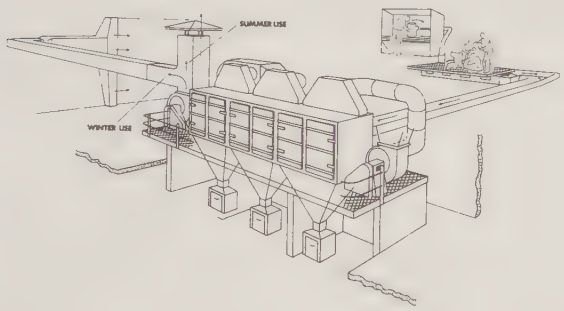
The Coal Board say that the price increases are necessary to maintain the viability of the industry when it is engaged in a big programme of capital investment to develop its productive capacity, so as to ensure the maximum availability of indigenous energy for the years ahead.

Reader Enquiry Service No. **7945**

NEW CLEAN AIR SYSTEM FOR MIDLANDS FACTORY

A new £33,000 dust collection system has been installed at the Lye, Staffordshire works of Bronx Engineering Ltd. Designed and built by Aldridge Air Control Ltd., of Aldridge, West Midlands, the system differs from conventional systems in that it recycles the dust laden air rather than venting it outside. Costly re-heating of replacement air is thus avoided and the significant improvement in the working environment is achieved without an increase in heating costs.

The system has been installed to remove dust pollution from Bronx Engineering's fabrication works where welds on a wide range of fabrications ranging from 1 to 30 tons are trimmed and dressed prior to the application of primer paint.



The energy saving system is based around three unit cartridge (UC) dust collectors capable of handling a total of 33,000 cfm. Dust laden air, drawn through grilles beneath the fettling benches is passed through the dust collection plant and then returned, pollution free to the works via a side blow air curtain. Heat loss through the collection plant is negligible and costly re-heating of the clean air on re-entry is minimal with substantial savings on fuel bills resulting.

The UC dust collectors comprise of crimped non-woven material elements which provide maximum filter surface area in a minimum volume of filter. This ensures a very low air to filter ratio of 2:1 which compares with the 6:1 ratio of conventional and less efficient bag filters. The latter are also far bulkier in size requiring considerably larger factory areas for installation.

The larger filter area of AAC cartridges – nearly 3½ times that of conventional filters – means a slower air movement through the system and consequently greater efficiency of dust collection. Filter cartridges are mounted horizontally and can be easily and quickly changed through large access doors. Horizontal mounting of the cartridges also means that the capacity of an AAC system can be increased by the simple expedient of building the cartridges up in height obviating the need to take up valuable factory floor space. The installation at the Bronx factory, in fact, only occupies a total floor area of 72 sq.ft., unusual for a system of its capacity.

Filter cartridges are cleaned automatically by pulses of compressed air, the increase in dust loading actuating the pulses. Dust removed settles at the bottom of the collectors. As the units don't need continuous pulsing, compressed air requirements are kept to a minimum resulting in further cost savings.

Reader Enquiry Service No. **7946**

Major British Breakthrough Saves 40 per cent Petrol

A British engineering firm has developed a new fuel source that will revolutionise the internal combustion engine – saving 40 per cent in petrol or diesel consumption, increasing power output by some 15 per cent and dramatically reducing pollution from exhaust gases.

A. J. Hoare (Engineering) Ltd. of Walsall have developed a 'aquapet' engine, powered partly by petrol but with added hydrogen and oxygen obtained from tap water.

In the cylinders, the hydrogen expands faster than the petrol vapour, cutting the inflow of the latter, thus reducing petrol consumption. The extra oxygen speeds the burn of the gas, eliminating the 25 per

cent wastage of petrol vapour which, in conventional engines passes through the exhaust system, giving further fuel economy.

In tests using the same Briggs & Stratton engine, fuel savings of 40 per cent were regularly achieved when using 'hydropet' gas, compared with petrol. Power from the 13 hp engine increased to 15½ hp.

Accompanying the 40 per cent fuel economy is a similarly large reduction in pollution further improved, in fact, by the added engine efficiency.

'The system has been designed, developed and thoroughly proved' claims Bert Hoare, Managing Director of A. J. Hoare (Engineering) Ltd. 'What is needed now is a miniaturised gas generator (designs exist already), a new alternator to supply the current for gas production, and a simple, but critical, air intake valve.

'Unfortunately, at A. J. Hoare we do not have the facilities to handle production and marketing on the necessary scale. Therefore, we are looking to offer the product under licence to a company, or companies throughout the world.

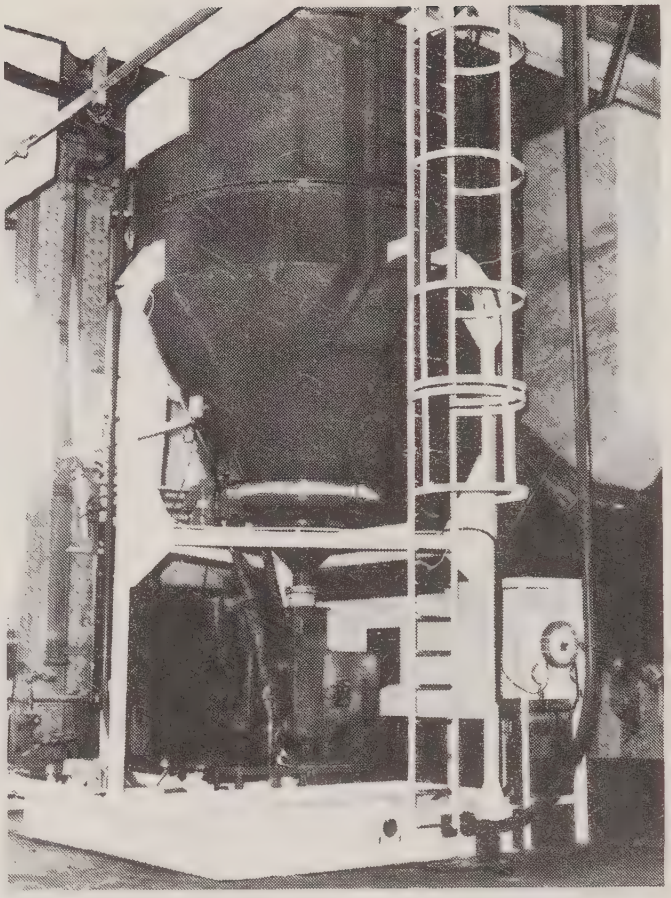
'After the final developments are completed, a motorist will be able to fit his car with a 'aquapet' fuel conversion for around £150', estimates Bert Hoare. 'With petrol at over £1 per gallon,' he says, 'it will pay for itself in less than a year, given average vehicle usage.'

There are, of course, many other uses for this invention, including pumps, generators, marine power sources and commercial vehicles.

Reader Enquiry Service No. **7947**

CEGB Power Station Given Clean Bill of Health

The illustration shows one of three bulk storage and metering systems at a CEGB power station, feeding CCL Powder Treatment into the flue gases of 3 x 120MW oil-fired boilers.



This is the 8th oil-fired power station of the Central Electricity Generating Board at which CCL have acted as main contractors for the supply of flue gas treatment systems over the last few years.

These systems are fully automated and incorporate the latest developments in the accurate, continuous feeding of powders hitherto considered difficult to handle, convey and meter.

The flue gas treatment supplied by CCL successfully eliminates major problems of acid smut emission and thus provides complete protection against the threat of injunction for closure of the Station, resulting from contravention of the regulations covering air pollution control in environmentally sensitive areas.

Excellent community relations have been restored and the Station can now concentrate on its main function, that of generating electricity at maximum efficiency and with maximum continuity.

Reader Enquiry Service No. **7948**

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CLEAN AIR

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CLEAN AIR

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CLEAN AIR is published by the National Society for Clean Air at 136 North Street, Brighton BN1 1RG
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FIFTY YEARS OF 'CLEAN AIR'

This Autumn this journal celebrates its Golden Jubilee. It first appeared in 1929 and in 1979 is still going strong. Although it has not always had the same title — it started as Clean Air, changed to Smokeless Air and then reverted to Clean Air — and has had many different formats and layouts, the journal's message has remained basically the same; clean air is beneficial and is the right of every individual.

Fifty years ago, although some people recognised that something should be done to rid the atmosphere of all-pervading smoke, many others considered that this was not necessary. Today, largely as a result of the missionary work of the Society and the influence of this journal, people regard clean air and a smoke-free atmosphere as part of their heritage. It is right that they should do so; but they must also realise that they must protect that right and that the cost of clean air is increasing vigilance. It is all too easy to allow standards to slip; and so the Society and this journal still have their roles to play.

But we also live in changing times. Over the years the Society, with its broad representation of all those interested in and concerned with clean air, has built up a reputation for taking a reasonable and well-considered view of what needs to be done. New problems, such as noise, now confront us, problems which require the same reasonable, well-considered approach. So there is a new role for the Society in the years that lie ahead.

At the time of writing, it has just been announced that the Government intends to bring forwards legislation to repeal Section 23 of the Clean Air Act of 1956 and to disband the Clean Air Council. While agreeing that the Clean Air Council has made a major contribution towards the improvement of the urban environment, especially in the early days of smoke control, the Government now feels that our air pollution problems though less acute, have become more diverse and more technical and that there is no justification for continuing the existence of the Clean Air Council. So with no statutory watchdog to uphold clean air interests, there is now all the more need for the Society to take a strong positive approach with regard to the furtherance of clean air and the reduction of noise. It is now up to us!

APPOINTMENT OF NEW SECRETARY GENERAL

The Council have appointed Air Vice Marshal Kenneth Kingshott, CBE, DFC, to succeed Rear Admiral P. G. Sharp as Secretary General of the Society as from the 1st January 1980. Air Vice Marshall Kingshott will be attending the Society's Annual Conference at Scarborough in October, where no doubt many members and their delegates will have the opportunity of meeting him.

AIR VICE-MARSHAL K. KINGSHOTT, CBE, DFC, MBIM, RAF

Air Vice-Marshal Kingshott retires from active duty on 1st January 1980 having completed over 36 years service with the Royal Air Force, much of which has been in overseas theatres. He joined the RAF in September 1943 and after initial training completed his pilot's flying training course in Florida, USA. On return to England he flew the Hurricane, Spitfire and Lancaster. Shortly after the war he was granted a permanent commission and then spent a number of years flying Short Sunderland flying boats. He operated throughout the campaign in Malaya and was also engaged in the Korean war when he was awarded the Distinguished Flying Cross.

After attending the RAF Staff College in 1959 he was once again posted overseas to Aden as a Squadron Commander where he spent two years flying on anti-terrorist operations in the Aden Protectorates. Then followed a spell of duty on the Directing Staff of the RAF Staff College in the rank of Wing Commander. After converting onto Canberra aircraft he spent two years in Malta, flying photographic reconnaissance missions.

He then spent a long tour of duty in the Ministry of Defence, first as an Assistant Secretary to the Chiefs of Staff Committee and then, following promotion to the rank of Group Captain, became Director of Administrative Plans in the Air Force Department. In 1971 he was appointed Commander of the British Empire and became Station Commander of RAF Cottesmore for two years. He then went to Germany as the Assistant Chief of Staff Plans and Policy in HQ Second Allied Tactical Air Force. Shortly after he spent six months on special duty engaged in a study on Central Region Air Reorganisation and in 1974 went to Ramstein in Southern Germany to set-up a new Air Headquarters.

Following promotion to Air Commodore he became Air Commodore Plans and Air at HQ RAF Strike Command and finally, following promotion to the rank of Air Vice-Marshal in 1977, became Deputy Chief of Staff Operations and Intelligence at HQ Allied Air Forces Central Europe, a post he vacates in October 1979. Air Vice-Marshal Kingshott has two sons aged 26 and 23 and is a widower. His main hobbies are golf and music and he still enjoys a game of tennis.

DIVISIONAL NEWS

NORTH WEST DIVISION

At the last meeting of the North West Divisional Council held at MANWEB, Sealand Road, Chester, on 17th July 1979, Mr. J. B. Douglas, Assistant Director, Environmental Health, St. Helens MBC, was appointed as Honorary Secretary to succeed Mr. W. E. Pollitt.

Mr. Pollitt has served as Hon. Secretary of the Division for the past 16 years and during that time the North West Division has been one of the most active in the Society. Even during the troublesome period of local government re-organisation, Mr. Pollitt ensured that the impetus of meetings was maintained. Mr. Pollitt and other members of the North West Division have also devoted much time to campaigning on the Society's behalf and explaining matters relating to Clean Air in various talks and lectures to outside bodies.

During his time at the Environmental Health Department, City of Salford, Mr. Pollitt played a large part in the remarkably successful smoke control programme of Salford City Council, which was completed in 1972.

As well as his great interest in the Clean Air matters, Mr. Pollitt has been a very active member of SSAFA (Sailors, Soldiers and Airmens Families Association) and has done much work on their behalf.

At the meeting, Mr. Pollitt thanked all members of the Division, and all those who had in any way been concerned with Divisional activities, for the kindly and considerate manner in which they had assisted him during his period of office.

The North West Division in particular and the Society as a whole are most grateful to Mr. Pollitt for his efforts on the Society's behalf during the years in which he has been a member of the Society's Council in addition to serving as Hon. Secretary of the North West Division.

P. G. Sharp
Secretary General

EAST MIDLANDS DIVISION

Some 60 members assembled at the Great Northern Hotel at Peterborough on a very pleasant morning on 6th September 1979 for a seminar on Industrial Noise. The meeting had been arranged by the British Gas Corporation Production and Supply Division and the person responsible for the arrangements was Dr. B. B. Goalby, DPhil, MA, BScChem, FRICS, CEng, MIGasE, the Senior Environmental Planning Officer.

Following the talks, there was a brisk session of questions and discussion — itself an indication of the interest aroused, and the Chairman found it necessary to call a halt so that the rest of the day's proceedings would not be delayed. Mr. Brackenbury thanked the speakers on behalf of those present and this was supported by applause.

Members were then entertained to an excellent buffet lunch at the kind invitation of the British Gas Corporation. Following the lunch, nearly 40 members boarded a bus to visit the Peterborough compressor station and to see at first hand the way in which the Gas Corporation had put into practice what had been discussed earlier, whilst the remainder of the party were shown on film the very comprehensive investigation and discussion which precedes the siting of these stations and then the way in which the construction is carried out.

Members were, I am sure, impressed by the very responsible attitude taken by the Gas Corporation to prevent environmental impact from the necessary installations which accompany the supply of gas which so many of us enjoy and take for granted. The Division is indeed indebted to the British Gas Corporation and its officials for this rare opportunity to be taken on the inside of their planning procedures and to actually see inside a compressor station.

E. F. Raven,
Hon. Secretary

DIARY OF EVENTS

1 November (Thursday)
p.m. Conference and Publicity Committee Meeting, London.

7 November (Wednesday)
a.m. Technical Committee Meeting, London.
p.m. Parliamentary and Local Government Committee Meeting, London.

15 November (Thursday)
EPEMA one day Workshop — 'A Practical Approach to Energy Saving in Industry'. Lecture Theatre, Society of Chemical Industry, 15 Belgrave Square, London SW1.

29 November (Thursday)
NSCA one day Teach-In: NOISE. Lecture Theatre, Society of Chemical Industry, 15 Belgrave Square, London SW1.

28 November (Wednesday)
p.m. Meeting of the Council of the Society, London.

CORRECTION

Vol. 9, No. 4. p.114 — Conference: Whole City Heating — Combined Heat and Power.

Details of this conference can be obtained from: The Conference Secretary (WCH) Construction Industry Conference Centre Ltd., P.O. Box 31, **Welwyn**, Herts AL6 0XA. Tel: **Welwyn** (043871) 6772.

OBITUARY

Philip Draper, CEng, FIMechE, FInstE

Philip Draper, a former Chairman of Council and for many years a member of the Council of the Society and a stalwart of the Technical Committee, died suddenly on 16th August 1979. He was 76, though he did not look it; and only a few days before his death he attended a meeting of Council where he was in particularly good form and looked to be in excellent health. He will be sadly missed.

Philip Draper was essentially a practical engineer with a practical approach to the problems of clean air. In his particular field of transport and the pollution it causes he knew not only what was required to be done but also how it could be done and at what cost. He regarded it as a waste of time to ask for the impossible and was highly sceptical of any suggestions for the reduction of pollution which were wasteful of energy.

One of Philip Draper's recent tasks on behalf of the Society, to which he gave his time and knowledge unstintingly, was as a member of the editiorial committee engaged in the production of the Society's new publication on pollution from road vehicles, a subject which was close to his heart and of which he possessed great knowledge. This booklet will shortly be published and will serve as a fitting epitaph to a kindly and truly gentle man who devoted a great deal of his life to the service of others.

CLEAN AIR COUNCIL

Michael Heseltine, Secretary of State for the Environment announced on 17th September that the Clean Air Council was to be abolished. The Clean Air Council was included in a list of QUANGO's (Quasi Autonomous Non-Governmental Organisations) to be axed, but in fact the Clean Air Council is a statutory body, and Parliament will have to repeal Section 23 of the 1956 Clean Air Act before the Council can be disbanded.

The National Society for Clean Air deeply regrets this decision, and deplores the lack of prior consultation on the matter. The Clean Air Council has not been called to a meeting since this Government took office and the Members of the Council have not yet met its Chairman, Michael Heseltine. The unfinished business of the Council includes several very important matters: lead in petrol, pollution from road vehicles generally (The Cinderella of Clean Air), and fluoride emissions from brickworks in Bedfordshire. We have yet to see a positive initiative on any of these matters from the present Government. The Clean Air Council was set up at the suggestion of the Beaver Committee for the purpose of reviewing progress in air pollution control in England and Wales, and for obtaining the advice of those with special knowledge, experience or responsibility in the prevention of air pollution. Throughout the 23 years of its existence, the Council has been an excellent vehicle for obtaining the opinions of a large cross-section of the community. If the Council disappears, those concerned with clean air matters will lose an important forum for discussion and co-operation, and will have to resort yet again to lobbying and campaigning to achieve their ends.

Although the emphasis of concern in clean air matters has changed, the Clean Air Council still has a role to play. In recent years, with the formation of very active

committees within the Council, it has been widely consulted by Ministers at the Department of the Environment, and has advised civil servants at every turn. The National Society for Clean Air is convinced that it is still necessary to keep clean air progress under review and to pool experience in air pollution control, but this decision to scrap the statutory watchdog means that the National Society for Clean Air and like-minded environmental groups must work all the harder.

COMMON MARKET TREATY NOW OUTDATED

The Rome Treaty which produced the Common Market is in need of fundamental revision.

This message was put to the Lords Select Committee on the European Communities on Tuesday 3rd July on behalf of CoEnCo by its Chairman, Lord Craigton and others.

The Treaty written over 20 years ago did not take account of 'environment' and although the Community has an environmental programme at least one of its Directives has already been criticised for being outside the law.

The evidence put forward by CoEnCo follows a Report from the Select Committee and a debate in the House of Lords during which amendment of the Treaty was suggested by Lord Fraser of Tullybelton and Lord Diplock.

Besides CoEnCo, a member of other organisations have recently proposed amendment of the Treaty, including the European Environmental Bureau, the Civic Trust and the Conservation Society.

CALL FOR PAPERS

The Second International Symposium on Toxic and Nuisance Dusts

University of Exeter, 21st, 22nd, 23rd July 1980

Papers are invited to be presented at the above Symposium. It is anticipated that titles will cover the following areas:
Interaction of technology and environmental legislation; Practical and theoretical developments in filtration mechanisms and monitoring techniques; Process dusts and the community; Operational and economic factors bearing on the practical use of dust extraction systems; Case studies of particular interest.

These topics are only meant as guide lines and should not prejudice prospective authors.

Title and a 100 word abstract (two copies please) should be sent to: Mrs. S. Gabriel, Symposium Organiser, 14 Grove Lane, Didsbury, Manchester M20 0UE (Tel: 061-434 1250). Closing Date: 7th December 1979.

As places will be strictly limited, intending authors and attendees are advised to contact the organiser as soon as possible.

Reader Enquiry Service No. **7953**

INVENTORY OF SULPHUR DIOXIDE EMISSIONS TO LONDON'S ATMOSPHERE

by

D. J. Ball and **S. W. Radcliffe**

In the Spring 1976 issue of *Clean Air,* one of us (DJB) described the early stages of work aimed at making the first formal emission inventory of air pollutants in Greater London. Since then, the sulphur dioxide part of the inventory has been completed. The general findings are presented in this article. A more detailed report which describes the method of compiling the inventory, as well as the results, has recently been published by the Greater London Council.*

To re-cap briefly, an emission inventory of an air pollutant for a region is simply a directory of the sources of that pollutant within the region. Many inventories are, like this one, in two parts. One part is a register of point sources: in this is recorded the amounts of pollutant annually or seasonally discharged from large individual sources of the pollutant, together with other details such as chimney heights, flue gas exit velocities and temperatures, and so on. The other part is called the area source inventory, and gives average figures for the region, or sub-divisions of it, for the collective emission from sources not large enough to be included in the point source register. The information contained in an emission inventory complements air quality monitoring data: whereas monitoring shows the extent to which the air is polluted, the inventory describes where the pollutants originate. The two can be linked by modelling, which attempts to calculate how pollutants are dispersed by, and interact in, the atmosphere.

We have chosen to start with sulphur dioxide in compiling the inventory of Greater London's air pollutants. This is because sulphur dioxide concentrations here are high by comparison with the GLC's guideline for this pollutant, and by comparison with its concentrations in many other major cities. Additionally, a proposal for an EEC directive on health protection standards for smoke and sulphur dioxide is currently under discussion. If the directive emerges in anything like its present form sulphur dioxide emissions in central London will need to be controlled to meet it: smoke control of stationary sources is, of course, complete in this area. The legal basis for the control of sulphurous emissions would be regulations made by the Secretary of State for the Environment under Section 76 of the Control of Pollution Act (1974). Another proposal being discussed at the time of writing is that put forward by Westminster City Council to extend to other parts of London the 1 per cent sulphur in fuel limit now applicable in the City of London. The inventory will be an important help in assessing and commenting upon the adequacy and cost of these proposals.

Point Sources

Following a pilot study in the London Borough of Hammersmith, we defined point sources as those that emit, or are likely to emit, more than 30 tonnes/annum of sulphur dioxide through a single chimney stack. This corresponds approximately to the emission

*An Inventory of Sulphur Dioxide Emissions to London's Air. D. J. Ball and S. W. Radcliffe. GLC Research Report No. 23. Available from GLC Bookshop, County Hall, London SE1 7PB. Pub. No. 7 168 **1097** 2, £4.50 in UK only.

Figure 1. Illustration of the format of the Point Sources Register: the sources are fictitious.

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**** GREATER LONDON EMISSION INVENTORY.....POINT SOURCE  FILE..........LONDON BOROUGH OF TOWER HAMLETS **************PAGE    64******
*                                                                                                                                *
*   AIR POLLUTION STUDY REGION 01                  SUBREGION 01                                                 BOROUGH NUMBER 05 *
*                                                                                                                                *
**********************************************************************************************************************************
--------------------------------------------------------------------------------------------------------------------------------
 QUEEN MARY BREWERY                                          SERIAL NUMBER      01010561          LAND USE CODE          TN
 9  TRIO  LANE                                              NO.OF SOURCES            01          SIC CODE              231
 E1 6ON                                                      YEAR OF DATA           1976
 PHONE    37  0020
 CONTACT  E HINGLEY                  POSITION WORKS ENGINEER

--------------------------------------------------------------------------------------------------------------------------------
STACK  01  BOILER RATING (MW)        34.1                   ANNUAL FUEL (THOU. TONNES)          5.5 STACK HEIGHT (M)          49
SOURCE 01  TYPE OF UNIT      SPINNING CUP                   SEASONAL FUEL USE (P/C) APR-SEP    48    STACK EXIT DIAMETER (M)   2.3
           FUEL              OIL                                                    OCT-MAR    52    FLUE GAS EXIT TEMP (DEG C)
           FUEL SUBTYPE      HEAVY FUEL OIL (3500SECS)      SCHEDULE               HRS/DAY    24    EFFLUX VELOCITY (M/S)
           SULPHUR (P/C)        4.5                                                 DAYS/WK     6    CHIMNEY MATERIAL     BRICK
           ASH     (P/C)        0.0                         PROCESS WORK  (P/C)            92    LINING MATERIAL      BRICK
                                                            SPACE HEATING (P/C)            08    STACK GRID REF       TQ360806
           FLUE GAS CLEANING EQUIPMENT - NONE

                                                                  SO2      PARTICULATES     NOX          CO          HC
           TOTAL FLUE GAS CLEANING EFFICIENCY (P/C)
           EMISSIONS AFTER CLEANING (TONNES/YEAR)                 496       ******        ******       ******      ******
           ESTIMATION METHOD                                        7
           COMMENT-  WOULD CHANGE TO GAS IF  ADVANTAGEOUS
--------------------------------------------------------------------------------------------------------------------------------
 LONDON   POWER STATION.                                     SERIAL NUMBER      01010526          LAND USE CODE          UE
 NORMAN RD.                                                  NO.OF SOURCES            02          SIC CODE              602
 E15 3NX                                                     YEAR OF DATA           1976
 PHONE    88 3711
 CONTACT  E.B.SMEDLEY                POSITION WORKS ENGINEER

--------------------------------------------------------------------------------------------------------------------------------
STACK  01  BOILER RATING (MW)        187.0                  ANNUAL FUEL (THOU. TONNES)         27.6 STACK HEIGHT (M)          99
SOURCE 01  TYPE OF UNIT      CHAIN OR TRAVELLING GRATE      SEASONAL FUEL USE (P/C) APR-SEP    24    STACK EXIT DIAMETER (M)   4.1
           FUEL              SOLID                                                  OCT-MAR    76    FLUE GAS EXIT TEMP (DEG C) 125
           FUEL SUBTYPE      BITUMINOUS                     SCHEDULE               HRS/DAY    24    EFFLUX VELOCITY (M/S)     10.2
           SULPHUR (P/C)        1.4                                                 DAYS/WK     7    CHIMNEY MATERIAL     CONCRETE
           ASH     (P/C)        6.8                         PROCESS WORK  (P/C)            **    LINING MATERIAL      BRICK
                                                            SPACE HEATING (P/C)            **    STACK GRID REF       TQ365842
           FLUE GAS CLEANING EQUIPMENT - CODE NUMBERS - 009.

                                                                  SO2      PARTICULATES     NOX          CO          HC
           TOTAL FLUE GAS CLEANING EFFICIENCY (P/C)                            75
           EMISSIONS AFTER CLEANING (TONNES/YEAR)                 697         376          152         ******      ******
           ESTIMATION METHOD                                        4           4            4
           COMMENT-  LOAD FACTORS - 1975/6 6P/C. 1977/8 6P/C. 1980/1 3P/C.
--------------------------------------------------------------------------------------------------------------------------------
STACK  02  BOILER RATING (MW)        187.0                  ANNUAL FUEL (THOU. TONNES)         27.6 STACK HEIGHT (M)          99
SOURCE 02  TYPE OF UNIT      CHAIN OR TRAVELLING GRATE      SEASONAL FUEL USE (P/C) APR-SEP    24    STACK EXIT DIAMETER (M)   4.1
           FUEL              SOLID                                                  OCT-MAR    76    FLUE GAS EXIT TEMP (DEG C) 125
           FUEL SUBTYPE      BITUMINOUS                     SCHEDULE               HRS/DAY    24    EFFLUX VELOCITY (M/S)     10.2
           SULPHUR (P/C)        1.4                                                 DAYS/WK     7    CHIMNEY MATERIAL     CONCRETE
           ASH     (P/C)        6.8                         PROCESS WORK  (P/C)            **    LINING MATERIAL      BRICK
                                                            SPACE HEATING (P/C)            **    STACK GRID REF       TQ366842
           FLUE GAS CLEANING EQUIPMENT - CODE NUMBERS - 009.

                                                                  SO2      PARTICULATES     NOX          CO          HC
           TOTAL FLUE GAS CLEANING EFFICIENCY (P/C)                            75
           EMISSIONS AFTER CLEANING (TONNES/YEAR)                 697         376          152         ******      ******
           ESTIMATION METHOD                                        4           4            4
           COMMENT-- AS FOR STACK 01
```

expected from boiler plant of capacity greater than 15 MBtu/hr burning fuel oil. Within Greater London, about 300 of these sources have been identified. They include power stations, large commercial and industrial boilers, hospital and office heating plant and some types of 'process source' such as sulphuric acid works, kilns, etc. The point source register contains details of these and of about 150 other sources, such as large gas consumers. A computer has been programmed to store, sort and present the data in various ways. One form of presentation is illustrated in Fig. 1 for some hypothetical sources. The first five lines of the print-out give the plant name and address, and the telephone number of a person responsible for its operation. Also included, mainly for analytical purposes, are the appropriate land-use code and the standard industrial classification. The serial number, unique to each chimney stack, identifies the position of the plant with respect to local authority boundaries. There then follows an eight-line description of the source features, most importantly its capacity, fuel consumption, fuel type and seasonal consumption, and chimney stack parameters. The final three lines give the efficiency of any flue gas cleaning equipment, the annual sulphur dioxide emission and a code number indicating how it was estimated. As will be seen, provision has been made in the system to record information on up to five pollutants.

Area Sources

This category includes small emitters, such as domestic residences, small commercial premises and industries, schools, etc. Three sub-categories have been defined, covering emissions from domestic, commercial/institutional and industrial area sources. As indicated in the earlier article, area source emissions have been estimated for each of the (1km x 1km) National Grid squares of Greater London: as with the point source register, these are kept on computer file.

Main Features of Sulphur Dioxide Emissions in Greater London

Most of the data we have gathered are relevant to the year beginning April 1975. It is estimated that 179,000 tonnes of sulphur dioxide were emitted to the atmosphere of Greater London during that period. Identified point sources accounted for 117,000 tonnes (about 65 per cent) of this total.

The geographical distribution of power stations and other point sources is shown in Fig. 2. There is a slight tendency for point sources, especially those whose emissions lie between 30 and 100 tonnes/annum, to be concentrated towards the River Thames. Although there are almost 20 power stations in Greater London, their annual emission of 55,000 tonnes was comparatively small. This is because the stations are generally old and their load factors are low. In fact, the main electricity generating plant in South-East England lies outside Greater London along the Thames Estuary. These newer stations discharge about 350,000 tonnes of sulphur dioxide during 1975/6: the two 'super' power stations at Grain and Littlebrook D were not operational at that time.

Fig. 3 is an area source emission density map in which the emissions from the three sub-categories mentioned earlier have been aggregated. This map very clearly illustrates the association between area source emission and building density, the highest emissions being found in central London.

An analysis of total emissions according to fuel type and source category is presented in Figs. 4 and 5, and Table 1. As smaller sources usually discharge their emissions nearer to the ground than larger sources, it may be inferred from Fig. 5 that the

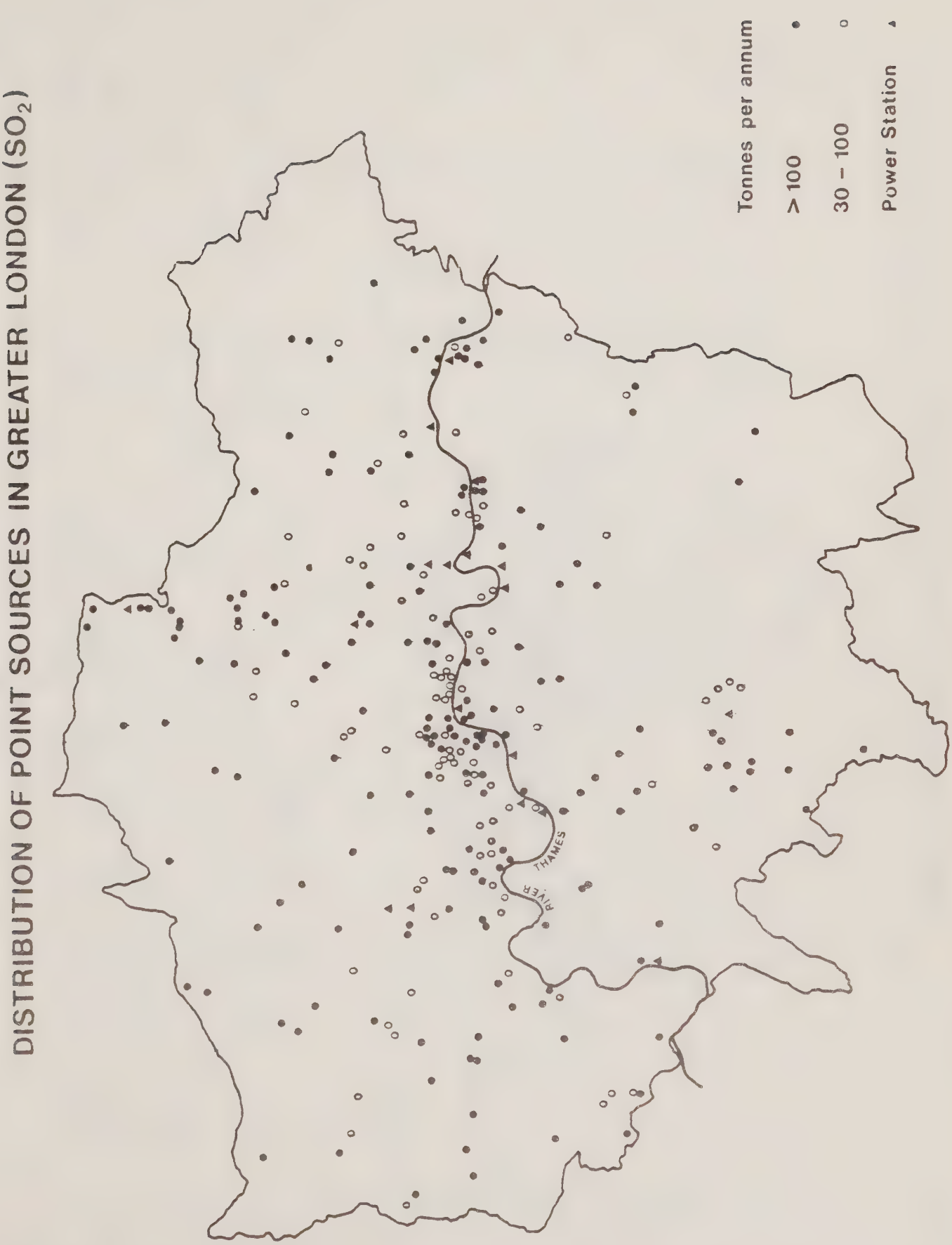

DISTRIBUTION OF POINT SOURCES IN GREATER LONDON (SO_2)
Tonnes per annum
> 100
30 – 100
Power Station
THAMES
RIVER

Fig. 2

AREA SOURCE EMISSIONS IN GREATER LONDON (SO_2)

main contributor overall to ground-level concentrations of sulphur dioxide in Greater London is the commercial/institutional sector. This will be most true in central London, where area emissions are highest. In some other localities, industrial emissions may predominate, but generally domestic emissions seem to be of minor significance. Industrial processes make up the largest group of the non-fuel-combustion sources (headings 2, 3 and 4 in Table 1). In the main, these are smelters, sulphuric acid manufacturing plant and coke ovens.

Table 1 Summary of the emissions of sulphur dioxide in Greater London in 1975/6

	Source Category	*Thousand (10^3) tonnes/yr*		*Source Category*	*Thousand (10^3) tonnes/yr*
	GRAND TOTAL	179	1c.	Comm./Inst. — area	31
				Comm./Inst. — point	26
	— AREA	62			
	— POINT	117		Solid Fuel — area	1
				Solid Fuel — point	2
1.	FUEL COMBUSTION	167		Gas/Diesel — area	13
				Gas/Diesel — point	1
1a.	Residential Fuel — area	10		Fuel Oil — area	18
	Residential Fuel — point	2		Fuel Oil — point	23
	Solid Fuel — area	9	1d.	Electricity	
	Solid Fuel — point	1		generation — point	55
	Gas/Diesel — area	1		Solid Fuel	18
	Gas/Diesel — point	1		Gas/Diesel	1
	Burning Oil — area	1		Fuel Oil	36
	Burning Oil — point	1			
	Fuel Oil — area	1	2.	INDUSTRIAL	
	Fuel Oil — point	1		PROCESS — point	6
1b.	Industrial Fuel — area	16	3.	SOLID WASTE	
	Industrial Fuel — point	27		DISPOSAL — point	2
	Solid Fuel — area	1	4.	TRANSPORTATION — area	5
	Solid Fuel — point	1		Motor Spirit	2
	Gas/Diesel — area	3		Derv	3
	Gas/Diesel — point	1			
	Fuel Oil — area	13			
	Fuel Oil — point	25			
	Process Gas — area	1			
	Process Gas — point	1			

A number of thoughts need to be borne in mind when using the inventory data. First, while every effort has been made to compile as complete a list as possible of point sources, some may have been overlooked; second, there may be inaccuracies in the data that have been supplied to us and errors may have been introduced in handling the large

Fig. 4

SUMMARY OF SULPHUR DIOXIDE EMISSIONS IN GREATER LONDON BY FUEL TYPE

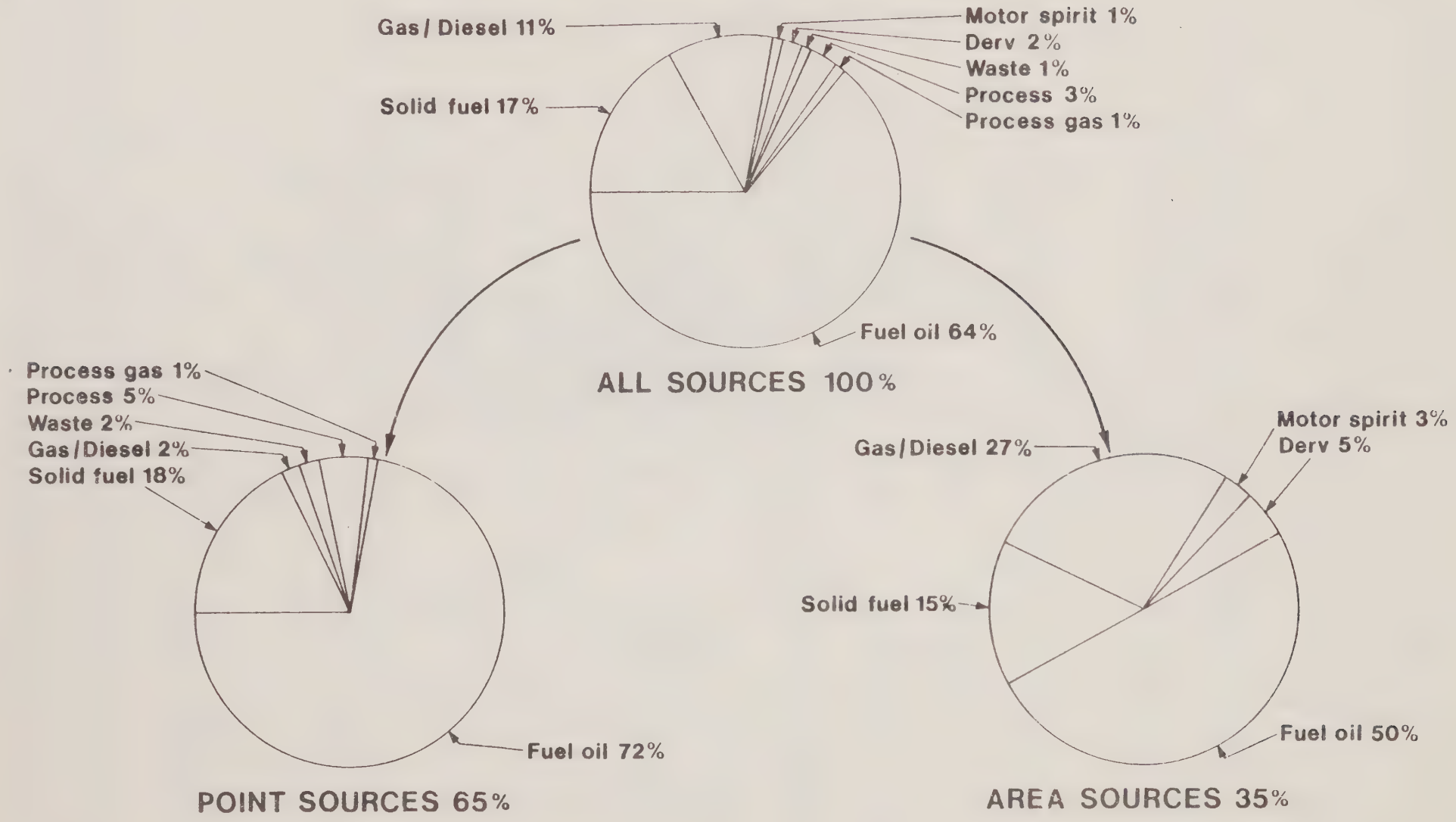
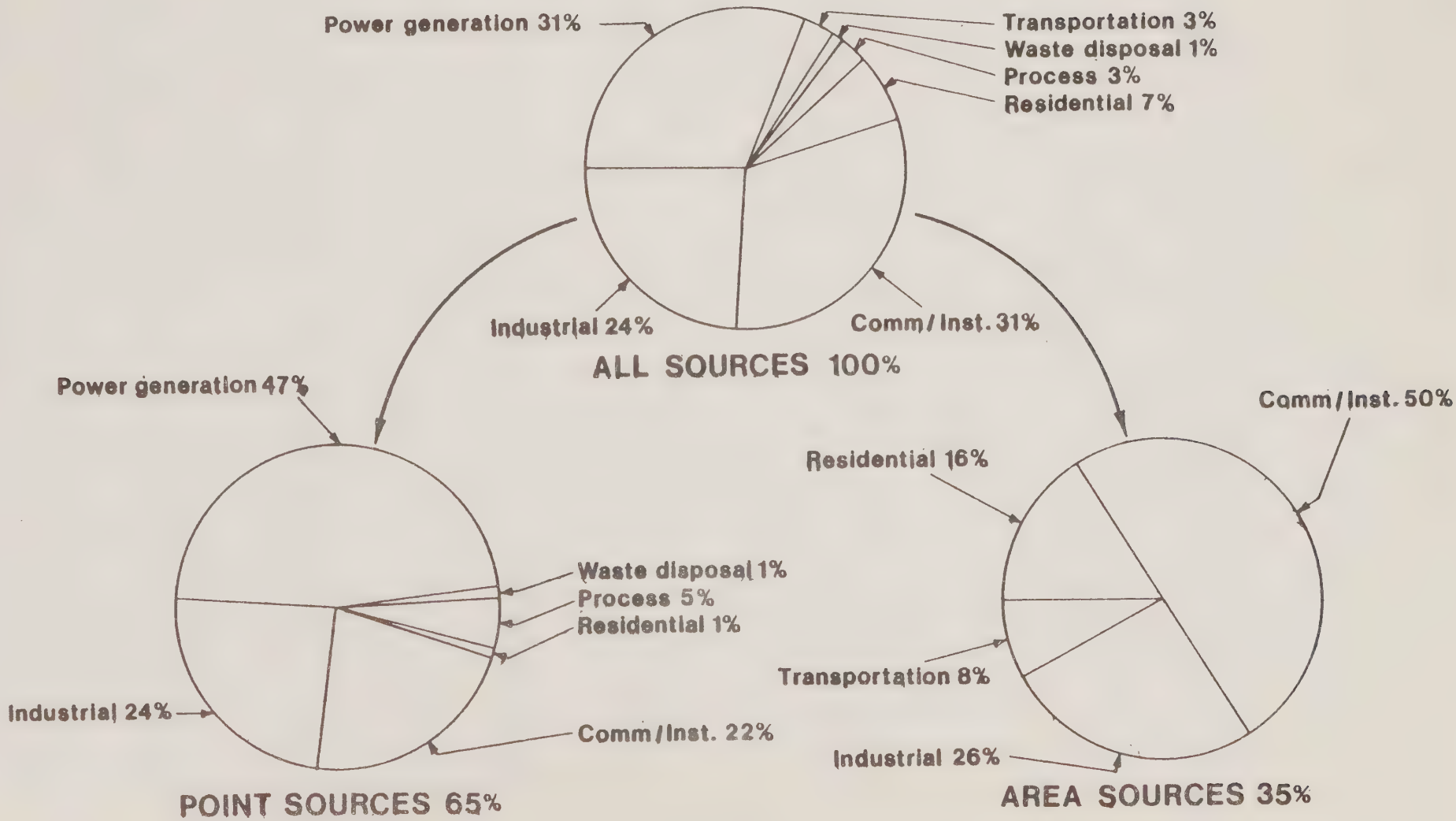


Fig. 5

SUMMARY OF SULPHUR DIOXIDE EMISSIONS IN GREATER LONDON BY SOURCE CATEGORY



quantities of data involved; and, third, there will be changes in emissions in the period between making and using the inventory. We have carried out a series of cross-checks and validity tests to minimse the first two sources of error. The final point will be countered by updating the inventory from time to time, say, at five-yearly intervals. In fact, a more detailed survey of emissions in the central area is presently under way.

Concluding Remarks

This project could not have been completed without the assistance at various times and in various ways of a large number of people. Borough Environmental Health Officers and their Chiefs, particularly those in Hammersmith and the City of London, contributed valuable local knowledge and administrative help. Many people in industry, commerce and the public services took time and care to fill out questionnaires. The British Gas Corporation, the Central Electricity Generating Board, Coalite and Chemical Products Ltd., the Departments of Energy and Environment, the Electricity Council, the Institute of Petroleum, the National Coal Board, North Thames Gas, the Rexco Group and Segas, all provided essential and detailed statistics: we are most grateful for all the help given.

At the outset, the job of compiling an inventory of sulphur dioxide emissions in Greater London was viewed with some trepidation, because of the size and complexity of the city and the limited resources available. However, experience has shown that this need not have been the case. The manpower provided by the GLC in co-ordinating the work and in collecting and analysing the data has amounted to little more than two man-years. Borough expenditure has been on average about one man-day per borough. An unquantified, but probably not very large amount of time has been spent by industry and institutions in responding to the questionnaires. Direct expenses have come to approximately £1,500. The costs were therefore small compared with, for example, those needed to establish and operate a modern atmospheric monitoring network. That it has been possible so economically to compile what is believed to be a fairly accurate and complete inventory is no small tribute to the generally co-operative attitude that exists in this country on pollution matters.

NEW PRESIDENT OF THE ENVIRONMENT HEALTH OFFICERS ASSOCIATION

Mr. A. (Mick) Archer, MBE, FEHA, City Environmental Health Officer of Birmingham is to be the 1980 President of the Environmental Health Officers Association.

Mr. Archer, who started his public health career in 1937, has spent most of his professional life in the Midlands, and is known both nationally and internationally as an expert on air pollution control; he was awarded an MBE in the 1979 New Year Honours.

From 1945 to 1973 he was Chief Public Health Inspector of Halesowen, then joined the country's largest environmental health department in Birmingham as Environmental Protection Officer and in 1976 took over as chief of that department.

In Birmingham he was in charge of a multi-disciplinary team carrying out research on lead pollution from motorways and on lead blood levels in children. Last year he was invited by the Department of the Environment to be Chairman of a Steering Committee on Lead Pollution in Birmingham.

He has served on Government Working Parties on chimney heights, emissions from iron foundries and lead and has presented many papers here and abroad on

pollution from industry. He is an adviser to the Association of Metropolitan Authorities and is a member of several of its technical Working Parties.

He has just taken part in a tri-national inner city project as one of a research group visiting Germany and USA to exchange ideas and experience on the subject of inner city rehabilitation. In 1978 the World Health Organisation invited him to give two lectures in Athens on industrial pollution control. He is also involved with the EEC Directive on Biological Screening of the Population for Lead, the first survey for which was started earlier this year.

Mick Archer is a Fellow of the Environmental Health Officers Association, served for 26 years on its General Council (of which he was Chairman 1965-6), is a past Vice-President, and one of the examiners on the Environmental Health Officers Education Board.

He lives in Stourbridge, is married and has two grown up sons. He will be officially installed as President of the EHA on 18th January 1980.

THE INSTITUTE OF MATHEMATICS AND ITS APPLICATIONS

CALL FOR PAPERS

Conference on the Modelling of Dispersion of Transport Pollution

The IMA Environmental Mathematics Group will be holding a two-day Conference on 17th and 18th March 1980 in Cambridge, on Modelling Dispersion of Transport Pollution. This is meant to be a Conference on these aspects and *not* on *all* aspects of vehicle pollution.

The subjects to be discussed are the air flows created by and around vehicles, air flows in city streets and open highways, basic aspects of turbulent diffusion in these flows, dispersion of pollution from single vehicles and groups of vehicles, comparison of observations with mathematical models, the use of wind tunnels and other physical modelling for these problems, particulate emission and dispersion (e.g. lead, smoke), dispersion of vehicle pollution on an urban and regional scale (e.g. Los Angeles, London). The Institute hope to have papers on mathematical and physical and theoretical and experimental aspects of these problems. A number of papers have already been offered, but extended abstracts are sought, to be submitted by **1st November 1979** by research workers interested in attending and presenting a paper. These will then be considered by the organising committee which includes: Dr. J. Hunt, AFIMA (University of Cambridge), Dr. A. J. Apling (Warren Spring Laboratory), Dr. A. C. Chamberlain (Harwell) and Dr. A. C. Keddie (Warren Spring Laboratory). Abstracts should be sent to Miss Jayne Foster, the Institute of Mathematics and its Applications, Maitland House, Warrior Square, Southend-on-Sea, Essex SS1 2JY. Participants from overseas, as well as the UK, are very welcome to attend.

NATIONAL ENERGY EFFICIENCY STANDARDS TO BE INTRODUCED IN BRITAIN

The first statutory national energy efficiency standards to be adopted in Britain are to come into force by January 1981. Covering heating equipment including central heating boilers and steam boilers, the standards are to become statutory under an EEC agreement. Similar action is being taken throughout the EEC.

The Government's proposals and its intention to introduce a Bill into Partliament to obtain the necessary powers are outlined in a consultative document* published by the Department of Energy. It is being widely circulated and comments have been invited by 31st October 1979. (A select committee from the Society will be commenting.)

Over 5 million heating appliances are sold in the UK each year and their efficiencies vary widely. The raising of energy efficiencies of these appliances will be an important advance for energy conservation.

The proposals stem from an EEC Directive on the performance of heat generators, under which all EEC member states are to decide on and enforce national efficiency standards for heating appliances.

The directive concentrates in particular on central heating boilers. But the consultative document, which follows informal consultation with many of those affected, points out that a very wide range of heating appliances are sold in the UK. Many domestic heating appliances already voluntarily comply with the efficiency levels set in British Standards. The document proposes that in the United Kingdom statutory efficiency standards should be set for all types of heating appliance, including individual room heaters which are not necessarily covered by the EEC Directive. Under the proposals of the consultative document the standards will apply both to imported and to UK — produced equipment. It suggests that exemptions should be granted for small heaters made in small quantities.

The standards required should in general be those set through the British Standards system and these standards should be progressively raised, says the document. It proposes that testing and approval should be carried out by existing approval bodies and that appliances which have passed a test should, where practical, have a plate showing consumption and heat output.

Separate consultation will be undertaken on two other matters required by the Directive: the prevention of installation of heating appliances below a minimum standard of energy efficiency and the standard of insulation for heating systems.

The Directive (EEC Directive 78/170/EEC) was first tabled in draft form by the EEC Commission in June 1977, and agreed in amended form in December 1977. The consultative document applies only to the United Kingdom: England, Scotland, Wales and Northern Ireland.

*'Heating Generators: Setting an Enforcement of Performance Standard: A Consultative Document', available free from the Library, Department of Energy.

ENERGY CONSERVATION SHOULD BE TAUGHT IN SCHOOLS

A call for more staff and money to be committed by the Government to effectively implement energy conservation in education is made in a report published in September.

The report* — of the Publicity and Education Working Group of the Advisory Council on Energy Conservation — recommends that:

— energy and energy conservation should become an integral part of all children's education;
— that special in-service training for teachers to teach energy conservation should be investigated;
— energy and energy conservation should be considered for inclusion in GCE and CSE examination syllabuses.

'The group has taken the overall view that while the Government is now undertaking a substantial programme of energy conservation measures, its commitment is not yet sufficient to cope with the magnitude of the problem', says the report.

The working group recognises the 'extreme importance of imparting the energy conservation message to the younger generation. Those who are in school now will, as adults, have to face a much more difficult energy situation towards the end of the century'.

It also looks at the need for education and training beyond the level of secondary schools.

*Energy Paper No. 37 available from HMSO price £2.

LETTER TO THE EDITOR

Dear Sir,

Lead from Petrol

The letter from the chairman of the Technical Committee of the Clean Air Council *(Clean Air,* 9 (3) 92, 1979) does not provide an adequate appraisal of the environmental impact of lead from petrol. The following points need to be set against those made by Professor Scorer:

1. The work of Chamberlain *el at* (1978) is not the only assessment of the effect of car exhaust gas lead on people (e.g. others have found that subjects, even in small groups of adults, can derive 40 per cent of their lead from exhaust gas). Furthermore, the AERE report (p. 102) states that the techniques used did not permit an assessment of the uptake of lead by oral ingestion of deposited and impacted lead. There is substantial qualitative evidence that this is a significant source of lead in man. Indeed, recent quantitative work has shown that the general belief that wild plants and animals contain equal amounts of natural and industrially derived lead is false. Thus, in a remote valley it has been established that the annual input of airborne lead to the valley exceeds by about a hundredfold the total amount of lead circulating annually within animals living there.

2. An air lead level of 1 $u gm^{-3}$ is not the only level of exposure with which we should be concerned. As the Harwell report states, for people living near a high traffic density 'the contribution of air lead to total uptake would appear to be comparable with that from diet' (even when the deposition vector is ignored).

3. Nasopharyngeal 'trapping' of aerosols is dependent on particle size. It is true that deposition is virtually complete at sizes greater than 10 microns but the dominant inhaled lead particles from car exhaust gas are appreciably smaller than this and reach the alveolar region of the lungs. The work of Rabinowitz *et al* (1977) confirms

that very little lead is incorporated from air by aerophagia, swallowing respiratory secretions, or ingesting lead aerosols which have become trapped in the mouth or nasal passages.

4. A portion of any lead that is swallowed is absorbed to a degree that is in large part a function of age; very young children absorbing the most.

5. Population studies to assess the ability of individuals to excrete lead have not been carried out. There may well be individuals with an abnormally diminished ability to excrete lead.

6. The consequences of using lead free petrol clearly depend upon individual exposures to exhaust gas, either directly or indirectly. Even in a small hospitalised group such as that used by Rabinowitz *et al* (1977) a substantial diminution was detected when the air was filtered. Bigger effects would be anticipated in young children because of their relatively higher metabolic rate and ventilation at rest, and a greater overall exposure to deposited and impacted airborne lead than adults. Furthermore, it would be prudent to take note of the recent calculation that growing children may be able to absorb as much as 5-10 times as much lead per unit body weight as can adults without developing elevated blood lead concentrations.

7. A range of blood lead concentrations is to be expected in any randomly selected population; e.g. the range for 429 Birmingham pre-school children was 7 to 89 *u*g/100ml, with a mean of 20 *u*g/100ml. [20% ⩾ 25 *u*g/100ml (Note: the natural blood lead level is 0.25 *u*g%)]. It is certainly not reasonable to conclude that such differences indicate that exhaust gas lead is not a significant contributor to children's body burdens of lead; the skewed distribution typically reflects differences in exposure, uptake, absorption, excretion and storage of an environmental pollutant.

8. Recent publications do not support the suggestion that a blood lead level below 30 *u*g/100ml is without effect. Indeed, the US Environmental Protection Agency's proposed national ambient air quality standard (1977) stipulates that the mean population blood lead for children should not exceed 15 *u*g/100ml (with the rider that blood lead levels below 15 *u*g% does not necessarily mean that these lower blood lead levels are known to be without risk). The latter proposition appropriately anticipated subsequent reports of neuropsychologic effects at body burdens of lead found among a substantial number of urban children.

To obtain a broader view of the issue, advocates of leaded petrol would do well to heed the findings of Patterson and his co-workers at the California Institute of Technology that 'present-day man is subjected to lead exposures that elevate concentrations of lead in skeletons about 500 fold above natural levels'. Such a perspective of the problem should dispel the idea that objectors to lead in petrol have luxurious 'purist objectives'. Indeed, the Clean Air Council should obtain the properly balanced cost of lead free petrol before classing it as a luxury.

Yours faithfully,

R. Stephens
Reader in Organic Chemistry,
University of Birmingham B15 2TT

INTERNATIONAL NEWS

IUAPPA Newsletter, Vol. 4, No. 22, August 1979

AUSTRALIA

Changes in Lead Alkyl Content of Motor Spirit Proposed

Like most industrial nations, Australia is seeking ways of conserving precious petroleum. Mr. Malcolm Fraser, the Prime Minister, recently appealed to State Governments to raise the regulated maximum allowable content of lead alkyls in motor spirit to 0.65 g/l. The two principal States concerned, New South Wales and Victoria, currently have limits of 0.45 g/l and they are now considering the request.

Ambient concentrations of lead in air, averaged over at least 30 days, rarely exceed 1 microgram/cubic metre, so the increase associated with higher lead alkyl concentrations should be very small.

Consideration is also being given to reducing the Research Octane Number (RON) of premium motor spirit from 98 to 97 to conserve crude, and one Company is proposing to introduce a 95 RON grade (present standard grade is 89 RON) to satisfy the needs of many Japanese cars without forcing them to use the 98 RON grade.

Report Recommends Deferral of Further Exhaust Emission Controls

Australian exhaust emission control standards (ADR 27A) are quite similar to those current in USA in 1973/74 (2 g km HC, 24 g km CO and 1.9 g km NOx). Car makers have complained that meeting these limits causes fuel consumption to rise by up to 10 per cent while Government fuel test reports indicate the fuel penalty to be negligible. Now a report by the Australian Academy of Tecnological Sciences has recommended deferral of the final stage of ADR 27A on the grounds that the small gains in pollution control did not justify the related increase in fuel consumption. The AATS found the increase to be 3 per cent. They also recommended widescale encouragement of the use of lighter vehicles, smaller engines and no new emission controls until 1985. No action has been taken on the report to date.

MEXICO

Air Pollution in Mexico City

by **H. Bravo A.*** and **R. Magaña***

This article outlines the present air pollution situation in Mexico City. The data used were obtained from the Mexican Government publication (1) in order to avoid discrepancies in data collection/presentation. Priority action requirements are also indicated.

Mexico City is located in the southwestern corner of an elevated basin, 2,240 metres above sea level at a latitude of 19° 26′ 13″ North with a very high incidence of calms and vertical gradient inversions of temperature during the year.

The City is part of a metropolitan area with about 15 million inhabitants, 1 million road vehicles, and having approximately 21 per cent of the total industrial activity of the country.

The reduced visibility, eye irritation, and objectionable odours associated with photochemical processes have become more frequent during the last decade in Mexico City. The various control methods initiated by the Government since 1972 in an attempt to reduce air pollution have failed to acknowledge the possibility that certain primary pollutants (NOx, HCs, SO_2, particulates) can be transformed into secondary pollutants (O_3, PAN, aerosols) by photochemical reactions in the presence of solar radiation (UV in a given wavelength).

Mexico City, with its accelerated growth rate, altitude, latitude, topographical and meteorological conditions, represents a unique case for the study of photochemical air pollution.

The oxidant problem is aggravated by the presence of high concentrations of suspended particles and sulphur dioxide. The Public Health Governmental Office responsible for the prevention and control of air pollution reported (1) the monthly average concentration of SO_2 for the months from January to July of 1976 and for the same period for 1978, in the areas NW and NE, as shown in Table 1.

MONTH	1976 SO_2 (ppm)		1978 SO_2 (ppm)	
	NW	NE	NW	NE
January	0.041	0.036	0.072	0.059
February	0.031	0.038	0.052	0.076
March	0.032	0.020	0.064	0.086
April	0.034	0.041	0.059	0.056
May	0.031	0.027	0.036	0.046
June	0.019	0.020	0.025	0.022
Average	0.031	0.030	0.056	0.057

Table 1. Monthly average concentrations of SO_2 in the NW and NE areas (1976-78)

As indicated by a comparison of data for 1976 with that for 1978, the SO_2 air concentrations in two of the most industrialised areas of Mexico City are increasing. This increase could be explained by

(a) the growth in industrial development
(b) the multiplicity of public services
(c) the use of inadequate control strategies.

It should be noted that the Mexican Burker oil type fuels contain 3.6 per cent sulphur by weight, diesel fuel contains 1.1 per cent sulphur and the gasolines 0.2 per cent. The high sulphur content of fuel might well account for the high concentration of SO_2 in the atmosphere, as no controls are applied to either the sulphur content of fuels or to emissions from industry (no regulation limiting SO_2 emissions is in existence).

With regard to suspended particulates, 50 per cent of the samples in the NE area show values greater than 250 $\mu g/m^3$. This statement is valid also for the SW area.

The existence of the photochemical cycle has been reported by H. Bravo A. (2). The cycle shows an increase of ozone concentrations corresponding from 08:00 hrs. to 18:00 hrs., reaching a maximum (15 pphm) at 13:00 hrs. This cycle was determined at two points in the City (airport and downtown).

Another air pollution problem affecting the situation in Mexico City, is the occurrence of dust storms, due to wind and temperature effects on the dry bed of Texcoco lake (located in the NNE area of Mexico City), and the eroded SE and SW mountains surrounding Mexico City. This phenomenon reaches its maximum during the dry months (February, March and April).

The use of the Mexican Index for Air Quality (IMEXCA) using modified US Air Quality Standards without soundly-based scientific Air Quality Criteria has the effect of misleading the public. The ozone cycle was determined in two sites, but maximum concentrations recorded in Mexico City are in the order of 0.47 ppm. The data presented indicated that the air pollution in Mexico City is an increasing problem and the levels reached are by no means advisable.

Priority action is required as follows:

(a) Official promulgation of Air Quality Standards.
(b) Implementation of adequate control strategies.
(c) Formulation of emission standards for specific sources of pollution, concerning dust and gaseous emissions.
(d) Make effective the promise of the Mexican Oil Industry to have ready for 1982 the natural gas distribution system for Mexico City.
(e) Modification of the IMEXCA INDEX (Mexican Air Quality — Index) in order to give the public realistic and true information.

REFERENCES

1. Secretaría de Salubridad y Asistencia 'Situación Actual de la Contaminación Atmosférica en el área Metropolitana de la Ciudad de México', Memorandum tecnico SMA/DESAT/04-78.

2. H. Bravo A., R. Magaña, A. Lowe 'Preliminary study of the Photochemical Process in the Air Pollution of Mexico City' International Clean Air Conference, the Clean Air Society of Australia and New Zealand, Brisbane, Australia, May 1978.

*Departamento de Contaminación Ambiental. Centro de Ciencias de la Atmósfera y Contaminación Ambiental. National University of Mexico.

UNITED STATES OF AMERICA

Standard Set for Airborne Lead

A new national ambient air quality standard to protect the public health from exposure to lead became effective 5th October 1978. The standard for this pollutant which at low levels may harm human nervous and blood-forming systems was set at 1.5 micrograms per metre of air based on a three-month average.

This is the first national ambient air standard EPA has issued since 1971.

It is well known that at certain levels, lead is highly toxic, but increasingly there is evidence that even at low levels lead may have more harmful effects than was previously believed.

In establishing the new standard, EPA determined that young children, ages one to five, are the most sensitive to lead exposure. In 1970 there were 20 million children in the United States under five years old. Of these 12 million lived in urban areas and 5 million lived in city centres where lead exposure is the highest.

The new standard is based on preventing children from experiencing exposure where their blood level would exceed 30 micrograms of lead per deciliter of blood. Blood lead levels above 30 micrograms are associated with an impairment in cell function which EPA regards as adverse to the health of chronically exposed children. There are a number of other adverse health effects associated with higher blood lead levels in children, including the possibility of nervous system damage even without overt symptoms of lead poisoning.

The greatest source of airborne lead is automobiles using leaded gasoline. Of the more than 160,000 metric tons of lead emitted into the Nation's air annually, about 90 per cent comes from automobile exhaust. This is an especially acute problem in urban areas and EPA's phasedown of lead in gasoline (to be completed by October 1979) is helping to reduce lead levels in urban children.

NEW SMOKE CONTROL ORDERS

The lists below are supplementary to the information in the issue of **Clean Air (Vol. 9, No. 3)** which gave the position up to **31st March 1979**. They now show changes and additions up to **30th June 1979**.

Some of the areas listed are new housing estates, or areas to be developed for housing. The total number of premises involved will therefore increase.

The list of new areas in operation of smoke control is based on the plans submitted to the Department of Environment, but may erroneously include some local authorities who have made postponements, without notifying the Ministry of the fact.

ENGLAND

NEW SMOKE CONTROL ORDERS IN OPERATION

Northern

Gateshead, Low Fell, No. 7; Stockton-on-Tees No. 13 (Moorhouse), No. 14 (Leven Road, Norton), No. 15 (Thornaby).

North West

Oldham No. 27 (High Street, Lees), No. 28 (Cowlishaw), No. 29 (Hollinwood), No. 30 (Clough/Grains).

Yorkshire and Humberside

Barnsley No. 15 (Penistone), No. 17 (Tankersley), No. 19 (Wombwell) (**Note:** these three orders came into operation 1.1.1979, but were accidentally omitted from the previous list); Doncaster No. 11 (Conisbrough); Scunthorpe No. 12.

West Midlands

Warwick No. 11 and No. 12.

East Midlands

Erewash No. 4 (Cotmanhay Farm, Ilkeston); South Derbyshire No. 5.

South East

Brighton No. 3; Gravesham No. 4.

NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Northern

Gateshead No. 10 (Dunston), No. 11 (Deckham), No. 12 (Carrhill), No. 13 (Bensham); Stockton-on-Tees No. 16 (Oxbridge) and No. 17 (Grangefield).

North West

Bolton No. 14 (Bolton No. 53) and No. 15 (Farnworth No. 98); Oldham No. 32 (Salts Street, Crompton); Pendle (Reedley); Wigan (Chevington No. 1).

Yorkshire and Humberside

Barnsley No. 20 (Royston) and No. 25 (Platts Common); City of York No. 8.

West Midlands

Coventry No. 22; Warwick No. 15; Wrekin No. 4.

East Midlands

Bassetlaw (Worksop Area No. 7) (Kilton); Lincoln No. 17; Mansfield No. 5; Rushcliffe No. 2.

South East

Brighton No. 4; Gillingham No. 10; Gravesham No. 5; Luton No. 15.

London Boroughs

Havering No. 10.

NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Northern

Allerdale No. 9 (Gray Street, Workington); Hartlepool No. 36; North Tyneside Nos. 13-18; Sunderland No. 19.

North West
Bolton No. 16 (Bolton No. 55A); Liverpool Nos. 31-33; Manchester (Beswick); Rochdale No. 6; Rossendale No. 3 and No. 4; Warrington No. 5 (Appleton Stretton and Hatton).

Yorkshire and Humberside
Kirklees (Batley No. 10) and (Huddersfield No. 19 (Berry Brow)); City of York No. 8.

West Midlands
Dudley No. 140 (Coseley); Newcastle under Lyme No. 11.

East Midlands
Bassetlaw (Worksop Area No. 7) (Kilton); Chesterfield No. 12 (Hasland and Spital).

South West
Bristol No. 16.

SCOTLAND

NEW SMOKE CONTROL ORDERS IN OPERATION

Clydebank District (Kilpatrick North); Strathkelvin District (Glasgow Bridge); Renfrew District (Elderslie) and (Johnstone South).

NEW SMOKE CONTROL ORDERS CONFIRMED BUT NOT YET IN OPERATION

Dumbarton District (Renton); City of Glasgow DC (East End No. 4) and (East End No. 5); Inverclyde District No. 1.

NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Renfrew District (Johnstone North); Motherwell District (Gowkthrapple); Strathkelvin District (Westermains).

WALES

NEW SMOKE CONTROL ORDER SUBMITTED BUT NOT YET CONFIRMED

Wrexham Maelor BC No. 6.

NORTHERN IRELAND

NEW SMOKE CONTROL ORDER IN OPERATION

Belfast CC No. 14.

NEW SMOKE CONTROL ORDERS SUBMITTED BUT NOT YET CONFIRMED

Belfast CC No. 15 and No. 16.

Petrochemical Complex

The Ministry of the Environment, Singapore, has appointed Messrs. Cremer and Warner Ltd., the Chemical Engineering Consultants, to assist the Ministry and the Anti-Pollution Unit in the control of environmental pollution from a proposed petrochemical complex. The firm has similarly advised various other Governments on pollution control in the chemical, petroleum and petrochemical industries.

The Consultants will advise the Government throughout the design, construction, commissioning and initial operation stages of the petrochemical complex. This will ensure that the best practicable means are adopted to control pollution from the complex.

SMOKE CONTROL AREAS

Progress Report
Position at 30th June 1979

(Figures supplied by the Department of the Environment, the Welsh Office, the Department of the Environment for Northern Ireland and the Scottish Development Department).

	England			*Wales*			*Scotland*			*Northern Ireland*		
Smoke Control Areas Confirmed to 31.3.79	5,037			34			273			79		
Acres		1,742,365			3,331			152,492			18,955	
Premises			7,340,879			10,754			618,459			56,606
Smoke Control Areas Confirmed (1.4.79-30.6.79)	26			—			4			—		
Acres		14,723			—			2,794			—	
Premises			57,161			—			12,269			—
Totals	**5,063**	**1,757,088**	**7,398,040**	**34**	**3,331**	**10,754**	**277**	**155,286**	**630,728**	**79**	**18,955**	**56,606**
Smoke Control Areas Submitted (1.4.79-30.6.79)	26			1			3			2		
Acres		16,888			236			862			466	
Premises			65,068			1,849			4,902			1,982
Grand Totals	**5,089**	**1,773,976**	**7,463,108**	**35**	**3,567**	**12,603**	**280**	**156,148**	**635,630**	**81**	**19,421**	**58,588**
Smokeless Zones (Local Acts) in Operation	44			—			—			—		
Acres		3,400			—			—			—	
Premises			41,060			—			—			—

BOOK REVIEWS

The Global Carbon Cycle. *Ed. Bolin, B. et al.* Scope 13. John Wiley and Sons, 1979, 491 pages. £17.50.

Scope, the scientific community on problems of the environment, held a Workshop to assess the global sinks and sources of carbon and the interaction mechanisms between the various carbon pools in March 1977. The meeting was attended by scientists from 22 nations and five work groups were set up with the task of preparing brief reviews on specific problems and outlining future action. One major problem concerns the carbon dioxide build-up in the atmosphere. It was felt that the answer to this problem could only be found by placing the CO2 problem in its proper environmental context, that is, the global cycle of carbons. Thus the papers from this Workshop treat the carbon cycle by dividing it into various segments: hydrosphere, biosphere, atmosphere and lithosphere.

It was found that various sources might account for the excess of CO2 in the atmosphere. At present the input of fossil CO2 due to fossil-fuel burning and cement production is now about 5 x 10^{15}g C/year. There is some uncertainty about this calculation due to possibly inaccurate data for China, differences between production and consumption data, etc. The additional input of non-fossil fuel CO2 due to deforestation, slash burning, and soil management practices is relatively unknown, but might be of the same order of magnitude as the input of fossil fuel CO2. The oceans could be an important sink for much of the carbon generated by the combustion of fossil fuel and generated in the soil. But the group report studying primary production and the carbon-budget of the sea recommended that the hypothesis of carbon fixation in marine sediment should be carefully tested, because of its importance as a potential sink for carbon. Some geological sinks for carbon are also thought to exist although the group reporting on the geologic carbon cycle noted that none of the sinks would exceed the size of a few 10^{14} g C.

In relation to plant communities, experiments have shown that an increase in ambient CO2 concentration either increases net primary production (NPP) or decreases transportation under optimal conditions. It is not known what happens when nutrients constitute a limiting factor as is usually the case in natural communities and even on many agricultural lands. With time, NPP increases to a maximum and then decreases gradually in natural communities. The group reporting on NPP and phytomass felt that total phytomass had been decreasing throughout the world as a result of the transfer of forested areas into arable land and the rapid urbanisation and degradation of several marginal lands due to human interference. The Workshop also reported that deforestation for agricultural purposes, especially in tropical and sub-tropical regions, could severely affect the global carbon cycle. In rain forests, such as those in Brazil, most of the organic matter and nutrients are bound up in the ground biomass. Increased exploitation of these forests will lead to a large removal of nutrients which could ultimately impoverish the soil and disturb the ecosystems. When forests are cut down, increased loss of organic matter through erosion also results. Rain forests also serve as large simulators of CO2, converting it to organic matter. A disruption of this equilibrium could have unforeseeable consequences.

In relation to atmospheric CO2 increase, it appears that the use of garbage incinerators for energy production, on the increase both in Europe and in the United States, means that rapid output of CO2 to the atmosphere will increase. These air pollution problems are difficult to solve. Recycling of waste material would decrease the amount of garbage and reduce the flow of carbon from forests, via society, into the air as carbon dioxide.

This is altogether a very interesting and comprehensive report on a complex subject, and many environmental issues are raised in the discussion.

NEW ADDITIONS TO THE NSCA LIBRARY

Approved Coal Merchants' Scheme. Revised Ed. '79. NCB. 35pp.

Air Pollution and Morbidity. National Agency of Environmental Protection and the National Health Services, Copenhagen. 78. 17pp.

Air Pollution from Road Traffic — A Review of the present position. P. T. Sherwood. P. H. Bowers. RRL Report 352. Road Res. Lab. Min. of Transport '70. 27pp.

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Atmospheric Pollution Measurements in West London 1973. A. J. Hickman. TRRL Report 709. 1976. 15pp.

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The concentration of volatile and particulate lead compounds in the atmosphere: Measurements at four Road Sites. D. M. Colwill, A. J. Hickman, TRRL Report LR 545. 1973. 5pp.

Exposure of drivers to carbon monoxide. M. R. Hughes. TRRL Report 798. 1978. 24pp.

Measurement of particulate lead on the M4 motorway at Harlington. M. G. Bevan, D. M. Colwill, L. E. Hogbin. TRRL Report 626. 1974. 26pp.

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British Nuclear Achievements. Sir Francis Tombs. The Electricity Council 1979. 24pp.

The Burmah Oil Company Limited. Report and Accounts for year ending 31.12.78. 48pp.

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Coal Study. Environmental Impact of coal consumed for Electricity Generation. CEGB submission on Energy and the Environment. CEGB 1979, 78pp.

Coalite Group Limited. Report and Accounts 78/79. 28pp.

Commission on Energy and the Environment Coal Study. Statement by Sir Derek Ezra NCB '79. 13pp.

Concawe 1978 Annual Report. Report No. 4/79. 16pp.

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Directory of Air Pollution Monitoring in the UK outside the National Survey. M-L Weatherley. WSL. DOI. '78. 107pp.

Economic Consequences of NOx and SO_2 Abatement in the Netherlands. Vols. 1 and 2. Metra Consulting Group for Ministerie Volksgezondheid en Milienhygiene '79. 32pp and 245pp.

Electric Vehicle Association of GB Limited. Annual Report '78. 9pp. and Handbook '78, 50pp.

The Electrical Association for Women, 54th Annual Report and Annual Report of Caroline Haslett Memorial Trust, 36pp.

The Electricity Council Annual Report 78/79. 36pp.

Electricity Supply and the Environment. CEGB Revised '79, 64pp.

Energy Commission Paper No. 22. Energy Pricing Principles. A paper by the UK Petroleum Industry Advisory Committee. DOE. 8pp.

Energy Commission Paper No. 23. Comments on the Green Paper on Energy Policy. 90pp.

Energy Commission Paper No. 24. A Commentary on Energy Com. Paper No. 21. M. Barnes, Chairman Electricity Consumers' Council. 4pp.

Energy/Environment Fact Book. US DOE and EPA, '78. EPA, 76pp.

Environmental Health Criteria 9. DDT and its Derivatives. WHO '79, 193pp. SwFr.16.

Environmental Health Impact Assessment. Report on a WHO Seminar — Greece '78. WHO '79, 30pp. SwFr.6.

Environmental Impact Assessment. Analysis of the Environmental Consequences of Significant Public and Private Projects. OECD 1979. 71pp. £2.

Environmental Pollution by Modern Methods of Livestock Production. Evidence by the Farm and Food Society presented to the Royal Commission on Environmental Pollution May '77, 39pp.

European Environmental Bureau, 2nd Biennial Report 77/78. 30pp.

Health '78. Annual Report for Borough of Langbaurgh. 36pp.

The Health Effects of Lead on Children. A Review of Literature published since 1976. Conservation Soc. £1. 27pp.

Lead Pollution — Health Effects. Proc. of Symposium, London '78. Cons. Soc. Working Party. 47pp.

Interagency program in Energy — Related Health and Environmental Effects Research. Project Status Report. Interagency Energy/Environment. R & D Program Report. US EPA '79. 159pp.

An Inventory of Sulphur Dioxide Emissions to London's Air. Research Report 23. D. J. Ball, S. W. Radcliffe. GLC. 36pp. £4.50.

Keep Britain Tidy Group. Annual Report 78. 28pp.

Lead in Petrol. An assessment of the feasibility and costs of further action to limit lead emissions from vehicles. Dept. Transport. July '79. £1. 70.

M25 Motorway Enquiry — Leatherhead, May '79. Leatherhead and Ashstead Motorway Protest Group. 37pp.

NCB Report and Accounts 78/79. 91pp. £1.50.

Proposals for Notification of Accidents Dangerous Occurrences, and Ill Health. Regulations and Guidance Notes. Consultative Document. Health and Safety Commission. '79. HMSO. 23pp.

Quarterly Statement on Nuclear Incidents. Health and Safety Exec. March '79. 17pp.

Report on Non-Government organisations Activities on Environmental Issues Related to UNEP Programmes. Prepared for the Governing Council of the UN Environment Programme. March '79. UNEP. 83pp.

The socially acceptable power plant. D. Downs. Inst. of March. Engs. 1978. Vol. 192, No. 33. 16pp.

Solid Smokeless Fuels Federation Annual Report. 78/79. 15pp.

Statutory Instruments 1978 No. 1609. Clean Air, The Smoke Control (Exempted Fireplaces) order 1978. DOE, HMSO, 1pp. 10p.

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Sulphur dioxide air pollution in the City of Westminster and proposals for its reduction. Report by Director of Env. Health. Westminster City Council. Feb. '79. 30pp.

Technology and the Environment. Noise. Reports from overseas posts. No. 11. 1979. Austria, France, Germany, Italy, Dept. Industry 39pp.

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Toxic Metals in the Environment. 2nd Ed. A. Smith. DOE. Dept. Trans. (Bibliography Series) 1979. 30pp.

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Unleaded gas — the way to go. US EPA September '78. Pamphlet.

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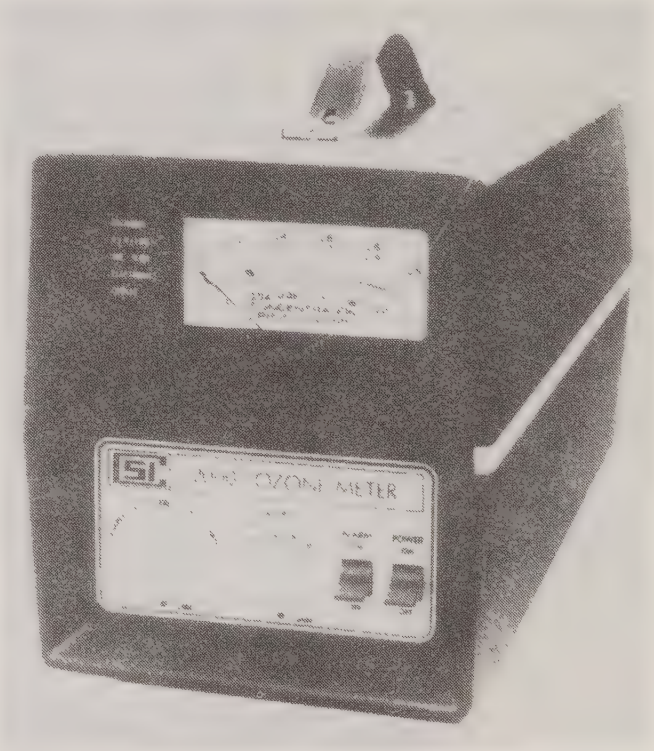
INDUSTRIAL NEWS

Portability comes to Air Pollution Monitoring

Kemtronix Ltd., of Compton, Nr. Newbury, have just introduced two new portable Ozone and Nitrogen Oxides Monitors, the Models 2000 and 2200, which will greatly simplify and bring down the cost of air pollution surveys in the future.

Both Models can be either battery or mains powered and even with battery packs installed weigh less than 22lb each. The Monitors use a highly specific chemiluminescence detector system which is based on the measurement of light generated during the reaction between any of the gases and ethylene. Since each of the reactions emits light of a highly specific and characteristic wavelength the system is highly accurate and insensitive to interfering gases such as Sulphur Dioxide which may be present in the reaction mixture. The Model 2000 Ozone Monitor has built-in ethylene gas bottle for use in the chemiluminescence detector system. The Model 2200 NO, NO_2, NOx Monitor generates its own supply of ozone for use in the Chemiluminescent detector.

Sampler gas concentrations are directly readable in ppm from the large meter display on the front cover and Model 2200 has switch selectable sensitivity ranges of 0-0.5, 0-1.0, 0-2.0 and 0-5.0 ppm.* The minimum detectable concentration is about 0.1 ppm for nitrogen oxides (0.01 ppm for ozone). Zero drift in the Model 2200 is kept to below 0.01 ppm over an 8 hour sampling period by the incorporation of a 5 second cycle switching system for the measurement of NO and NOx, into the electronics pack. Small controlled zero and span drift rates are essential for the accurate determination of ozone levels. This is achieved in the Model 2000 by carefully regulating the temperature in the photomultiplier detector and the reaction chamber along with their associated electronics. Built-in audible alarm systems clearly signify whenever a preset threshold concentration level of detectable gas has been exceeded. There are also built-in outputs for permanently recording levels in a chart recorder. Switch selectable self diagnostic facilities are built-in to both instruments with internal systems status being displayed upon the front panel meter.



To complement these new models, Kemtronix's have also introduced a new series of Ozone Generators and Calibrators for them and other instruments, including Sulphur Dioxide Monitors.

Not only do the Models 2000 and 2200 have an extremely good specification they are competitively priced. Their UK selling prices being as follows:

CSI 2000 O_2 Monitor — £2,695.00 plus VAT.

CSI 2200 NO, NO_2, NOx Monitor — £3,400.00 plus VAT.

Reader Enquiry Service No. **7958**

*Measuring ranges on the Model 2000 Ozone Monitor are 0-0.1 ppm, 0-0.2 ppm, 0-0.5 ppm and 0-1.0 ppm full scale deflection.

The equipment consists of a Projector and Receiver, which are mounted on opposite sides of the chimney or duct and a control box, with an indicating meter. Provision is allowed for the incorporation of a strip chart recorder, if required.

The system's operation is simple but effective — a collimated beam of light is projected from the projector unit, the amount of light is measured by the measurement cell in the control box and the interference of the light beam, by dust particles, is monitored on the indicating meter. The equipment can be set at an accepted obscuration level and any rise above this level is indicated by the alarm light, in the lid of the control box. The projector and receiver units are fitted with the unique 'Everclean Windows', which enable the optical system to be kept free of soot and dust particles, by providing a long frictional barrier between the optical element and flueway.

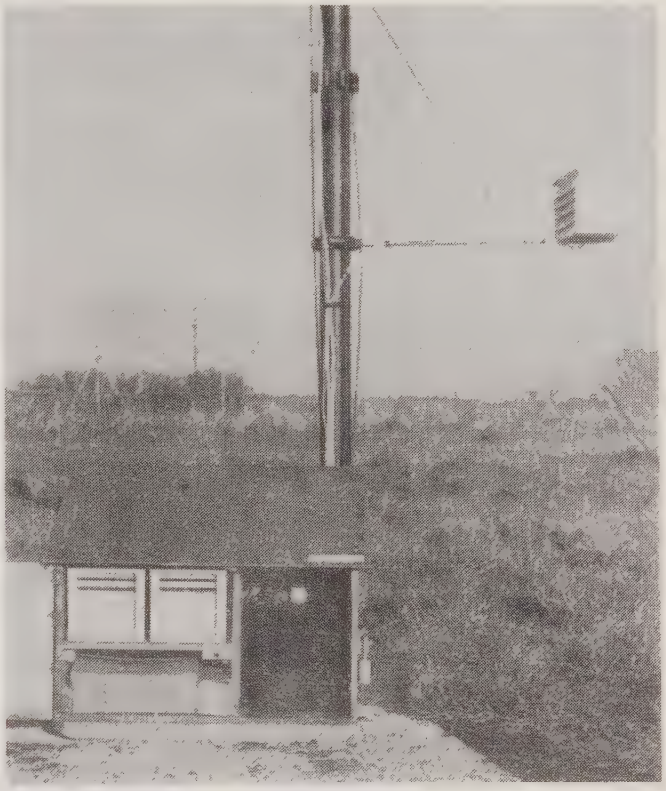
Reader Enquiry Service No. **7964**

Clearspan Recorders Play a Valuable Part in Sound Propagation Investigations

Two Foster Cambridge Clearspan P102L two pen, strip chart recorders are playing an important part in a study of sound progagation through air over different ground conditions. The research is being carried out on behalf of a European client by Acoustic Technology Limited, of Southampton.

The P102L is a compact electronic recorder marketed by Foster Cambridge. It has a 100mm chart width and is available with a variety of electrical input options as well as electrical contacts for alarm or control of external equipment. The instrument can be supplied to record on a roll chart or on a tear-off fanfold chart.

Clearspan P102L recorders are supplied by Foster Cambridge for operation from either the mains power supply or from a 12V d.c. power source. Acoustic Technology selected the second option because they wished to operate their instruments at an isolated location, from a standard car battery.



The battery is housed with the recorders in a protective cabinet, situated at the foot of a mast. Temperature and wind sensors are mounted on this mast: air temperatures are detected at heights of 1m and 11m by means of resistance thermometers housed in louvred cases. The resistance thermometers are connected to each of the two channels of the first P102L recorder, which provides accurate traces of the ambient temperatures at the two heights. Wind speed and direction are detected respectively by an anemometer and a wind vane, each of which is attached to a transducer delivering a low voltage d.c. signal to the appropriate channel of the second P102L recorder.

The charts from the Clearspan P102L recorders are compared with readings, made at the same time, of sound pressure levels detected at various distances from a sound source of known intensity. Sound propagation is greatly influenced by meteorological conditions such as wind velocity and direction, atmospheric temperature gradient and humidity and also the type of

terrain. The investigations carried out in this experiment are valuable in understanding these effects, and enable environmentalists to estimate such important effects as the noise that proposed industrial plants will inflict on neighbouring residential areas.

Foster Cambridge Limited is a member of the George Kent Group.

Reader Enquiry Service No. **7965**

Life in the Press Shop is Quieter now at Newman Electric Motors

Production workers in the Press shop at the Yale, Bristol works of Newman Electric Motors now lead a much quieter life, thanks to a noise-reduction system devised by the company.

The company is happy, too, because the new arrangement is safer yet eliminates cumbersome machine guarding, is tidier because it incorporates automatic removal of scrap and, by using ingenious 'do-it-yourself' methods, the overall cost of achieving it was less than a third that estimated professionally.

Biggest source of noise in the shop were eight automatic, rotary notching presses. These are used to punch, with machine-gun like speed and clamour, many millions of holes in the many thousands of steel laminations required to build up electric motor rotors and stators.

Newman has managed to reduce the perceived noise level from these machines to about one-quarter of what it was by the installation of a row of acoustic booths. The work was carried out as part of a general re-organisation of the factory which had the twin objectives of improving conditions and efficiency through better work-flow.

The line of booths, looking not unlike a railway coach, were designed by Newman. Purpose-made acoustic booth fronts and doors were specially purchased, but the rest of the structure — dividing walls, acoustic lined ceilings, ventilation ducting and so on, were constructed by the firm's own carpenters and maintenance staff, with help as necessary from local builders.

Previously each press had to be fitted with individual wrap-round mesh guards which had to be carefully maintained and were a hindrance to efficient production. Newman devised an inter-lock system for the booths doors. Now each machine operates in its own protective booth, and the only access to it is through a safety interlocked door which cannot be opened until the machine is switched off.

The booths are individually ventilated, too, which has helped to minimise oil-mist and so contribute to cleaner, healthier working conditions.

Automatic scrap removal is an additional feature, which it was convenient to install at the time the rest of the work was carried out. An under-floor conveyor runs the full line of the booths and deposits the scrap in a skip outside. It has eliminated the need to empty individual bins every day and has contributed a lot to the general tidiness of the area.

Don Alway, industrial engineering manager, who was responsible for the project has monitored sound levels at every stage. He says that the average noise from a press prior to the protective measures was around 98 dBA; now it is in the region of 78 dBA — well below the maximum specified in the Health and Safety at Work Act for continuous working without ear protection.

He admits that the press shop generally is still not the quietest area in the factory. Nevertheless, his measurements show that the general noise level elsewhere in the shop has dropped from about 91 to 87 dBA. Though the difference in figures may not seem great, a 4 dBA reduction is very significant in its effect on the ears.

When Newman Electric Motors first planned the scheme, estimates were received of up to £75,000 for sound insulating the eight presses. They did it themselves for around £20,000 — and that includes the under-floor scrap conveyor.

Reader Enquiry Service No. **7966**

CLEAN AIR

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HORSES FOR COURSES

The Department of the Environment White Paper 'Central Government Controls over Local Authorities' (Cmnd 7634) seeks to relax bureaucratic controls over local government activities. This is in line with the Government's stated aim for local government as elsewhere in the economy, of placing responsibility where it properly belongs. The National Society for Clean Air, invited to comment on the White Paper, has objected to the proposals on several grounds, and particularly to the removal of those provisions made under the Clean Air Acts and the Control of Pollution Act which allow in certain circumstances for appeal to be made to the Secretary of State. No concrete proposals have been put forward as alternatives to the appeals procedure, which the Government admits is 'generally the most efficient way consistent with natural justice of enabling a third party to have his case heard on its merits'. The Government seem to be seeking to demonstrate their commitment to local authority self-determination without regard for the possible consequences of their proposals.

There is already a large measure of discretion as to how local authorities operate clean air and noise legislation. Problems and priorities vary widely from area to area, but, for example, the extent to which monitoring is undertaken depends very much upon the financial and manpower resources of the individual local authority. There is also widely varying use made of the information obtained by monitoring and measurement. The GLC has established its own guidelines for certain pollutants and uses the guidelines as an aid to responsible decision-taking. While specific standards for a variety of pollutants are unlikely to be generally welcome, many local authorities have to make decisions about broad targets or desirable levels in their area. This challenge has been taken up successfully by some authorities, but others, smaller and poorer, are hampered from the outset by lack of equipment and expertise.

For many years Warren Spring Laboratory has co-ordinated the National Survey of smoke and sulphur dioxide; WSL and DOE are currently examining the future of the Survey and it is clearly time for a critical review of the monitoring effort, both nationally and locally. Some guidance is needed on the allocation of resources to meet local needs. Indeed, local authorities without the means to purchase expensive equipment may need more than guidance. At the recent Clean Air Conference a delegate called for government aid to help finance the purchase of modern pollution monitoring equipment, appropriate to the needs of local authorities; this finance not to be apportioned against local government expenditure, but to come from a totally separate fund.

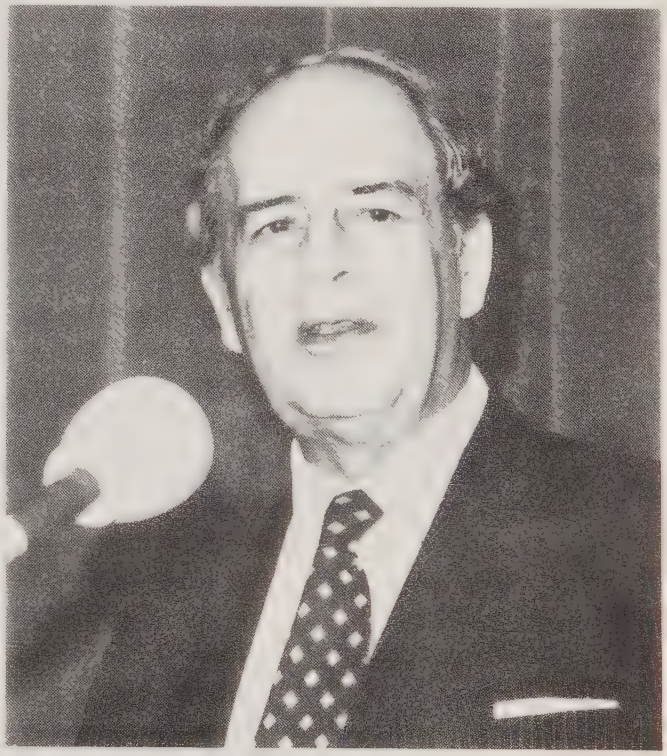
While it is clear that many local authorities want to face up to their responsibilities in the fields of air pollution and noise, the simplistic devolution of powers proposed in Cmnd 7634 bears no relation to the real requirements of local authorities. Only co-operation, between central and local government as well as between individual local authorities and industry drawn together by common membership of such bodies as the NSCA, will ensure that environmental quality is maintained, and improved wherever possible. At a time when local authorities are being urged to curb spending all round, the Government should not forget its ultimate responsibility for the quality of the environment. Laggard local authorities should not be able to use 'THE CUTS' as a blanket excuse for inactivity, and where help is needed, the Department of the Environment should be able to make discretionary grants from a central fund.

46TH CLEAN AIR CONFERENCE, SCARBOROUGH

After a gap of seven years, this year the Clean Air Conference was held in Scarborough, 15-18th October at the Spa Theatre, an auditorium which was exactly the right size for the Conference in its present shape and form.

In all some 286 delegates attended the Conference and all sessions were well supported throughout the three days. Because of the general interest of the subject, the first session was also open to pupils from the senior forms of schools in the Scarborough area and some 160 children came to listen to Mr. Jack Scott. The theme of the Conference was 'Weather and Air Pollution' and the programme started with papers about the weather generally and then worked through the effects of the weather on pollution, measurement and monitoring to the effects of pollution on the weather. (Summaries of papers presented appear in this issue under 'Pollution Abstracts'.) Generally all the papers were very well received and all speakers made a genuine attempt to pitch the levels of their presentation to suit the audience. Nevertheless, as ever, there were a few adverse comments that some papers were too technical.

Unfortunately because of an important previous engagement the Society's new President, Sir Derek Ezra, MBE, was unable to attend Conference on the Monday evening and so it was necessary to defer the opening session until the Tuesday morning. Sir Derek came to Conference on the Wednesday and delivered his Presidential Address on the Wednesday afternoon. The full text of his address will be published in the next issue of *Clean Air*.



Sir Derek Ezra

The usual social programme supported the Conference; the Chairman held his reception at the Royal Hotel on the Tuesday evening and on the Wednesday evening the Mayor and Corporation of Scarborough entertained all delegates to an excellent cabaret and dance in the Ocean Room at the Spa. The Mayor and Corporation also very kindly entertained all members of the Council of the Society to luncheon at the Town Hall on Tuesday. There were social visits to York and to Whitby, two technical visits to the Meteorological Station at Royal Air Force, Church Fenton and two morning demonstrations of flower arranging and glass and china ware respectively for the ladies. The Solid Smokeless Fuels Federation Golf Competition was held on the Tuesday afternoon and was won by Mr. W. Meredith of Portsmouth with 34 points.

Dr. B. Smith, Mr. H. I. Fuller, Mr. Jack Scott and Prof. R. S. Scorer

Mr. R. F. Shapter, Mrs. Shapter, Mrs. Twyford, Mrs. Sharp and Mr. W. B. Twyford at the Chairman's Reception

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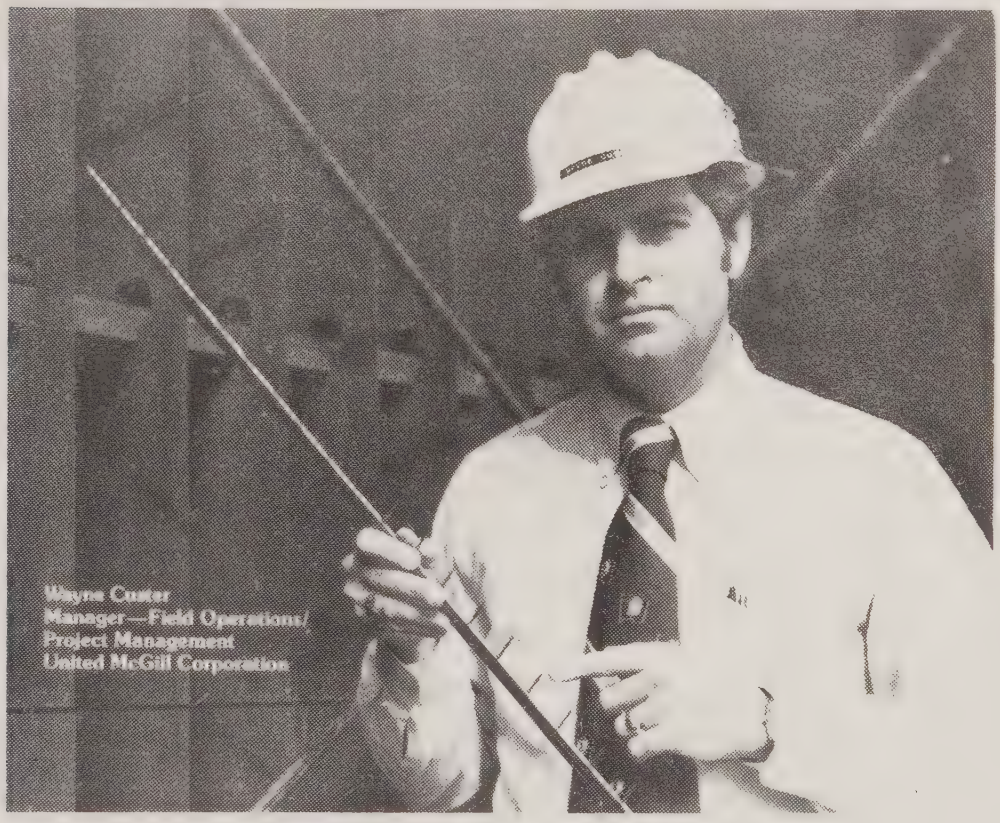

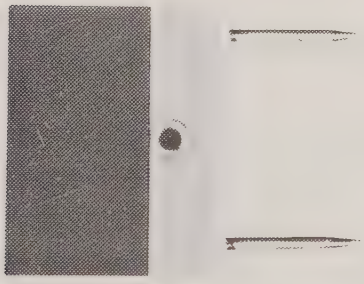

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POLLUTION ABSTRACTS

Summaries of papers presented at the 46th Clean Air Conference are given below. Individual papers, or sets of papers and discussions, may be obtained from the Society's Brighton Office, price 50p per paper or £5.00 per set, plus post and packing (20 per cent).

123. **The Weather,** Jack Scott, Meteorological Office.

This paper deals with the weather and how it is formed, and with forecasting in the short, medium and long term.

124. **The Accuracy of Forecasting Pollution,** Dr. F. B. Smith, Meteorological Office.

Predicting plume dispersal involves a daunting range of meteorological and environmental parameters that may be important. Except in very complex cases, the ground level concentration of pollutant sampled in the plume over a few minutes and at downwind distances of up to a few kilometers can usually be estimated fairly accurately provided the emission rate is known. Accuracy improves as the period over which the plume is sampled is increased. Errors usually occur because of inherent variability within an otherwise uniform air flow. At large distances downwind the accuracy becomes gradually less, because errors in trajectories are typically cumulative, especially on the scale of weather systems such as depressions and anticyclones. In certain rather important instances it might be essential, or may simply be desirable, to forecast concentration levels ahead of time. In some cities around the world, concentration levels of smoke and sulphur dioxide occasionally reach levels which might present a definite hazard to inhabitants with chest and heart complaints. In the case of accidental releases of some toxic, explosive or radioactive material from an industrial plant, wind speed, direction, and other meterological parameters may change very significantly, and an estimate of these changes is required as soon as possible in order to dispose whatever emergency services are available to the best possible advantage of the public. Forecasting could also be of use in predicting the long range transport of air pollutants, although in practice such forecasting is obviously subject to error and any immediate solutions, such as switching to a low sulphur fuel at appropriate large industrial plants, would be costly.

125. **The Effects of Weather on Pollution,** Professor R. S. Scorer, Imperial College of Science and Technology.

One of the fascinating aspects of air pollution is that it has been an important means of making air motion visible without significantly modifying it. The one very important exception to this general statement occurs when the pollution is copious and motion almost non-existent. The mechanics of pollution dispersion are discussed, including dilution by wind and mechanical stirring, thermal convection and stratification. While there is nothing mysterious about pollution near to a known obvious source, pollution can be carried long distances sometimes without dilution and can cause a great nuisance tens of miles away from the source. Ths most serious pollution problems undoubtedly occur when air stagnates near the ground, trapping pollution from vehicles and domestic sources. The author also discusses stratospheric pollution and transcontinental pollution.

126. **Meteorology and Air Pollution,** Dr. D. J. Moore, Central Electricity Research Laboratory.

The natural defence of living organisms against toxic effluents is the great capacity of

the atmosphere to dilute and in many cases subsequently to rid itself of these materials. The mechanism which ensures the dilution of effluent gases and which is necessary to enable life to exist is atmospheric turbulence. This turbulence is produced in two ways. Firstly, by the stirring of the wind caused by the drag of the surface and objects projecting from it and secondly by convection currents rising from the surface when the surface is warmer than the air. While a full discussion of atmospheric transport and diffusion processes would take a whole book, this paper explains the most important features of these processes.

127. **General Methods of Measurement and Monitoring,** Dr. A. W. C. Keddie, Warren Spring Laboratory.

Changes in monitoring methods which have taken place in the UK during the past 20 years or so are described. These changes reflect advances in technology and in its application as well as the need to monitor a wider range of pollutant species with greater temporal resolution, specificity, precision and reliability. Brief summaries of the conclusions which can be drawn from the more important surveys are included.

128. **Advanced Methods of Monitoring and Measurement,** Dr. R. Varey, Central Electricity Research Laboratory and David E. Green, Central Electricity Board, N.E. Region.

During the last decade a number of 'advanced' measurement systems have been developed for measuring the concentration of pollutant gases and particles in the atmosphere, both at ground level and up aloft. This paper is in two parts. The first deals with instruments designed to track the rise and dispersion of industrial plumes and to measure the concentration of gaseous pollutants not only at the ground but also up in the atmosphere. The second deals with a survey carried out in the Selby area of Yorkshire into the occurrence of trace elements in fine particulates. This multi-element survey of solid particulate aerosols is being carried out in co-operation with and partly financed by the Selby District Council. For a number of years there has been increasing interest and concern about the concentration and effects of trace elements present in the atmosphere in particulate form. The objectives of this joint investigation are to determine the concentration of trace elements in solid particulate aerosols in the Selby District and to attempt to determine the contribution of Drax Power Station to this atmospheric burden.

129. **Factors Affecting Environmental Sound Propagation,** Mr. H. S. Gill and Professor J. B. Large, Institute of Sound and Vibration Research, Southampton.

Environmental noise is assuming increased importance in many countries and it is thus becoming necessary to be able to predict or measure more accurately the sound levels from very many intense noise sources. If noise levels are found to be excessive, methods of controlling the impact of noise on the community can then be initiated. The propagation of sound in the atmosphere occurs as a result of transmission of acoustical energy to a point of observation and by far the most important factor in this propagation, other than the characteristics of the source itself is the weather (specifically, the micro-climate of the first 100 metres or so above the ground). The lower atmosphere is constantly in motion, and as noise propagation depends on the transfer of energy from one molecule to another, so received noise levels fluctuate. The longer the transmission path through the atmosphere, the less certain the average amplitude and the greater the fluctuation in the received sound. This paper outlines the physical phenomena associated with the propagation of sound outdoors, and presents the theoretical basis together with some measured data. In addition, the effects of source characteristics and physical environment along the propagation path are outlined. A simplified approach in

overcoming the practical difficulties associated with predicting environmental noise is presented and examples are given with respect to air and road traffic noise sources.

130. **The Effects of Weather on Noise Measurement and Assessment,** Peter Sutton, Esso Refinery, Fawley.

The author discusses atmospheric factors which affect noise propagation significantly and considers some general aspects of neighbourhood noise measurement. The paper is specifically concerned with measurement and assessment of noise from a particular works some distance away and the author points out that there is bound to be some noise from other sources present at the measuring location. He discusses the procedure for assessing neighbourhood noise from industrial activities and points out the practical difficulties involved in determining exactly what level of noise is generated by a particular works. Noise from a continuous process may be drowned during the day by traffic and 'social' noise and therefore may be acceptable, but at night noise from a continuous process may be far more prominent and unacceptable. Practical experience in neighbourhood noise measurement indicates that the most important single factor causing variation in noise propagation near to the ground is wind direction. Many weather conditions restrict the opportunity for taking valid measurements. Established methods of assessing community response to industrial noise are based on the traditional situation where factories exist close to housing in industrial towns and villages. Large modern process works are now often located in rural or semi-rural areas where background noise levels are low and works noise may be intrusive at a considerable distance from the works. Current assessment methods are not applicable to this situation because they do not deal adequately with the day-to-day variations in noise levels from a distant works caused by varying weather conditions.

131. **The Accuracy, Interpretation and Use of Results Obtained from Monitoring and Measurement of Air Pollutants,** Dr. M. J. R. Schwar, Greater London Council, Scientific Branch.

The Greater London Council (GLC) is just one of many bodies having to choose between various courses of action depending, amongst other things on air pollution considerations. This paper gives a snapshot picture of a number of pollution exposure situations of interest to the Council in its day-to-day work. While instrument accuracy is referred to, rather than dwell over-much on this aspect, attention is focussed in the main on how well monitoring procedures describe people's exposure, bearing in mind that they may come into contact with a variety of sources of pollution during their daily activities. Numerous examples of measured pollutant concentrations are given to illustrate how pollutant concentrations can vary with time and from place to place. These are discussed under three headings. The first deals with exposure to sulphur dioxide and smoke, the second with exposure to traffic pollution, and the third with a variety of other pollutants and sources of pollution.

132. **The Effects of Pollution on Climate,** Dr. B. J. Hoskins, Department of Meteorology, Reading University.

The author discusses the climatological history of the Earth in order to present a perspective on possible effects of man's pollution on our climate. He points out that climate has always changed and would have continued to do so in the the absence of man's interference. On the time-scale of tens of thousands of years it is probable that our climate would have become colder. The time-scale of man's activities suggests that over the next century the effects of his pollution on climate could be dominant over any natural variation. Our understanding of the atmosphere, oceans, and ice is such that no definitive

predictions can be given. This is particularly true when we consider the crucial variation of climatic effects from one place to another. The evidence available suggests that most of man's pollution is leading towards a warming. The effect of carbon dioxide produced from the burning of fossil fuels is thought to be most important in this respect. Extrapolating from energy trends in the last decade, the best present knowledge suggests that by the middle of the next century man's activities would have led to a changing climate including an averaged 2°C temperature rise. This would make the Earth almost as warm as a 150,000 years ago and probably as at any time in the last million years. Precipitation amounts would change and those areas suitable for growing specific crops would be different. Although knowledge is insufficient to predict with any accuracy, account of any possible effects on climate should be part of any energy strategy. This must be a global strategy as climate knows no national boundaries.

APPOINTMENT OF NEW SECRETARY GENERAL

We regret to inform members of the Society that, for personal reasons, Air Vice-Marshall Kenneth Kingshott is unable to take up the post of Secretary General to the Society as previously announced.

Rear Admiral P. G. Sharp will remain in the post until a new Secretary General is appointed.

The Society's Response to the Government White Paper — Central Government Control over Local Authorities (Cmnd 7634)

The Government has announced its determination to reduce substantially the number of bureaucratic controls over local government activities. The White Paper, issued September 1979, is produced as a result of the review of a large number of controls and lists in an annex nearly 300 controls the government intends to repeal. It also contains a number of controls where the intention is to effect a substantial relaxation. The Government's stated objective is to provide councils with greater local discretion and autonomy giving them more choice and flexibility to allow them to become more efficient in their use of both money and manpower. After publication of this White Paper, the Government asked for comments about the particular controls to be removed or relaxed, which had to be submitted by the 1st October 1979. The National Society for Clean Air was one of the bodies invited to submit comments.

Among the proposals, there were about 25 specifically concerned with the operation of the Clean Air Acts '56 and '68, and sections of the Control of Pollution Act dealing with air pollution and noise. The Society's Parliamentary and Local Government Committee considered the proposals in detail at a specially convened meeting. Although both local authorities and industry are represented on this committee, the various members agreed to a remarkable extent on their opinion of the proposals. The Society's comments may be summarised as follows:

Paragraph 5 of the introduction to the Paper explains that there are a number of statutory provisions which affect the autonomy of local authorities but are not strictly controls over their activities. There are for example very many provisions which allow third parties to appeal to ministers against local authority decisions. The paragraph stated that the Government had concluded that in the majority of cases, a right of appeal to the Ministers was generally the most efficient way, consistent with natural justice, of enabling a third party to have its case heard on its merits. Nevertheless it seems that it is just this right of appeal that this White Paper seeks to repeal and this seemed to the Society to be inconsistent. With the right of appeal removed, this reduced the rights of the individual and could lead to conflict. The existence of a right of appeal was conducive to responsible decision-taking. Although it was not known what was the burden of work placed on central government by appeals made under the existing legislation (for example Clean Air Act 1956 section 6 (4) and (5) and section 10 (3)) it was thought that this was not very great; the fact that the right of appeal existed was in most cases enough. The Paper did not make it clear what might be substituted for this right of appeal; but it was felt that whatever was introduced was likely to be no less time-consuming on the part of Civil Servants in central government. It was also felt that if decisions in some cases were left to individuals or local authorities this could lead to a lack of uniformity. In turn it was possible that this lack of uniformity could, in time, lead to a demand for more uniform control to be applied by central government. The position would not be helped because in some of the smaller local authorities particularly, there was a lack of expertise which could militate against a uniform approach.

In relation to the proposal to repeal certain provisions of the Control of Pollution Act, it was felt to be an inopportune time to do this as these provisions had only been comparatively recently introduced and there has been no real opportunity to

test them out in practice. The Society feels that clean air legislation is reputable and has stood the test of time. If changes are made which removed the rights of the individual, whether industry or local authority, there would be the risk of conflict.

Dealing with some of the specific proposals, the Society commented, with reference to Clean Air Act 1956 section 11 (1), (5) and (6), and schedule 1 paras. 4 and 5, that the removal of the necessity of central government confirming smoke control orders could be dangerous. There could be a danger of revocation by local authorities of existing smoke control areas over which there would be no Government control. On the other hand, when a smoke control order is made, central government is responsible for 40 per cent of the cost. If this confirmation is removed central government would not be in a position to exercise any control over the total amount spent. In the event of there being any disagreement between central and local government as to what was grant-earning, this would not become apparent until the final account was submitted, by which time the money would have been spent and the local authority would be unable to recover it. The Society also objected to the proposal to scrap section 6 (3) of the 1968 Clean Air Act, which prescribes the form for application of chimney heights approval. It was felt that the removal of this form would lead to a lack of uniformity and that the regulations and form should be retained.

Commenting on the proposals regarding the Control of Pollution Act 1974 section 79 (5), (6) and (7) and section 81, the Society stated that these provisions had been brought into being after a lot of work and consultation and it felt very strongly that they should be retained. The provisions have been in force for a comparatively short time and there has been little chance of ascertaining how well they operate. These provisions were not introduced to curb the power of local authorities and it was not felt that they would restrict the local authority in any way; in fact they were designed to bring local authorities and industry closer together and in those authorities where indemat committees, etc. have been instituted this has been achieved.

With regard to provisions about noise under the Control of Pollution Act 1974, it was generally felt that any repeal of these provisions is far too early. Very few noise abatement zones have yet been brought into operation and it is too early to change the system. One member of the committee described this as 'throwing the baby out with the bath water'. In any event, the provisions regarding appeals apply just as much about noise as they do about clean air and should be retained.

With a few exceptions, therefore the Society objects to the proposals relating to the repeal of the various provisions of 1956 and 1968 Clean Air Act, and of the Control of Pollution Act 1974. In particular, the Society feels that the Secretary of State should be able, if required, to act as umpire in an impasse between local authority and industry or even in some cases local authority and local authority. It was felt that the provisions ensured that decisions were taken responsibly and that the rights of the individual were protected. Although the Society agrees that local responsibility should belong to the local authority, it sees no reason why a final court of appeal should be scrapped willy nilly without firm and specific provisions to protect third parties against decisions taken at local level.

OPERATION CHIMNEY PLUMES COMES OF AGE

by

A. J. Clarke,

Head of Environmental Section
Generation Studies Branch, Planning Department, Central Electricity Generating Board

Twenty-one years ago this month, at 8.45 a.m. on Thursday, 4th December 1958, a Dakota aircraft taxied around the perimeter track of Heathrow Airport. It took off to the east down the runway, and about 3½ hours later landed at the airport in Guernsey, in the Channel Islands. Not in itself a remarkable occurrence. But that flight was the culmination of nearly two years of planning and waiting. Its purpose was unique; and in its way, it made a significant contribution to the history of clean air.

For one thing, Dakota G-ALWC (Call-sign 'Whiskey Charlie', to the initiated) of Fairey Air Surveys Limited was the only aircraft to take-off or land that day at London Airport or, indeed, at most other airports in Southern England. A dense fog had arisen overnight and air traffic was virtually at a standstill. Visibility at Heathrow was down to a few metres and the ASMI ground-control radar system had to be used to monitor the position of Whiskey Charlie on the taxiways. Instructions were relayed to the pilot by radio so that he could find his way around the perimeter track and line up the aircraft on the main runway. The high intensity runway lights were turned on but only one or two at a time could be seen through the fog as the pilot opened his throttles and accelerated down the runway; no doubt mentally crossing his fingers as he did so. (Was it sheer coincidence that the aircraft was piloted that day by a Captain L. C. Hazard?)

At 800 feet above the ground, Whiskey Charlie broke through the fog into bright sunshine and headed for Central London. The purpose of the flight was to obtain visual and, if possible, photographic evidence that the hot plumes of flue-gas from large power station chimneys were sufficiently buoyant to penetrate the fog layers. Theoretical studies made by the CEGB a few years previously had predicted such a penetration but the difficulties of obtaining practical confirmation were formidable. There was, in fact, no alternative but to get above the fog in the appropriate conditions and make visual observations.

The use of a tethered balloon was considered but quickly rejected for a number of good reasons. A helicopter might have been ideal in some ways but, 21 years ago, they were not as reliable as today and clearance could not be obtained for flying one over crowded London under such hazardous conditions. The problem of getting the machine down again safely was also insuperable. A helicopter did not have the operating range to reach an airfield that was certain to be clear of fog. (In contrast, a Dakota had an endurance of eight flying hours and could carry enough fuel to take it as far as Malta, if all the airfields of Europe were simultaneously fog-bound!) The survey had to be made, if at all, by a fixed-wing aircraft and Fairey Air Surveys Limited were approached by CEGB in 1956 to discuss the possibility of making a flight in foggy conditions.

Fairey's responded enthusiastically to the challenge and further discussions were initiated with the Civil Aviation Authorities, with air traffic controllers, and with the Meteorological Office. A complex plan was drawn up — which read like a military operation — with step-by-step timing from the first notification of possible fog by the Meteorological Office to the actual arrival of the aircraft over a selected group of power stations in East London (Brunswick Wharf, Blackwall Point and West Ham 'B'). Under this plan, all flying personnel had to be assembled overnight at a hotel near Heathrow; the aircraft had to be prepared at its home base of White Waltham (near Maidenhead), fuelled and flown to Heathrow; the power station staff had to be alerted; special communication channels opened up between aircraft, power stations and air traffic control; even special arrangements to secure insurance cover for the CEGB observer who was to fly in the aircraft.

With all these plans meticulously prepared, the many people concerned stood by in readiness in October 1957 and waited for a forecast of impending fog. They waited in vain all winter — no fog occured and the operation stood down in the following April. Yet another example of the fickle British weather!

However, the enforced hiatus in the summer of 1958 allowed another development to be brought to fruition. It had been recognised from the start that the identification of the plume from an individual power station chimney might be very difficult and this was necessary in order to link the observations to the theory. There was even some doubt whether a plume of flue-gas would, in fact, be visible against a sea of fog when seen from above. An approach to a pyrotechnics manufacturer resulted in the production of some giant-sized red marker flares which could be ignited in the chimney duct at Brunswick Wharf Power Station when the aircraft was known to be overhead. This would hopefully colour the plume from one of the chimneys sufficiently to make it identifiable above the fog; with this achieved, the identity of other plumes would follow from their relative locations.

In late 1958, power station emissions were just coming under the control of the Alkali Inspectorate. Recognising the importance of the operation, the Inspectorate willingly gave their blessing, not only to the artificial colouring of one plume, but to the deliberate production of dark smoke from the other chimney for a short period of time, by manipulation of the fuel burners.

Meanwhile, the Decca Navigation Company had specially prepared some very large scale charts of East London for use with their Navigator System, with which Whiskey Charlie was fitted. On these, it was possible to locate the individual chimneys at a single power station. Together with the 'smoke signals', it was now expected that positive identification would be achieved.

In October 1958 the operation (now known by its code-name of 'Operation Chimney Plumes') was again brought to the alert. An opportunity to test the system soon arose. On the 27th of the month, a dense fog was forecast for the London area and preparations were made according to the plan. However, for technical reasons, it was not possible to move Whiskey Charlie to Heathrow on the 27th and the operation was mounted from White Waltham, instead. The aircraft took off at 0800 hours on the 28th in about 200 yard visibility and climbed above the fog at about 800 feet.

Ted Davies, of the CEGB South Eastern Region, was the Board's observer on the aircraft and a number of photographs were taken during the flight. There were severe problems with the communication network, however, and with the identification of the power station plumes (the pyrotechnic flares had only just arrived at the station and could not be made ready in time). Also, the fog was not as thick as expected over East London so that, apart from the power stations, many other plumes were penetrating the fog, confusing the situation.

One problem with the communications then in use was that much of the cross-talk took place on open radio wavelengths. On later flights, an additional VHF radio operating on frequencies allocated to the CEGB was installed in the aircraft to give direct communication with the power stations. Even this did not avoid all problems; on one occasion an instruction from the aircraft to Brunswick Wharf to prepare to make dark smoke was overheard by an American airliner captain some distance away, over Europe. This prompted him to ask the Fairey aircrew whether they were electing a new Pope!

The results obtained during this flight are described later but its main benefit was the proof that the whole operation was practicable and that visual and photographic confirmation of plume penetration could be obtained. It was decided to maintain the operation in readiness for the rest of the winter in the hope that another fog would arise. This occured on the 4th December 1958.

This time, the aircraft was able to move to Heathrow on the previous evening as planned and the conditions for take-off on the 4th have been described. On this occasion, the Board's observer in the aircraft was Glyn England, now Chairman of the CEGB. To digress for a moment, the year 1958 had been notable for the Board in a number of ways, including the setting up of a new Development Policy Branch within Planning Department. This contained a small group which, for the first time, were to be solely employed on the environmental problems arising in the Board's work. As Head of the Branch, Glyn England — who, with the author, had been responsible for initiating the 'Operation Chimney Plumes' project — continued his interest in its detailed planning and execution.

The flight on the 4th December 1958 was wholly successful. The communications were vastly improved as a result of the experience with the previous flight and the marking of the Brunswick Wharf plume with red smoke was quickly spotted from the aircraft. A large number of useful photographs were obtained for later analysis. One more flight in the series was attempted in January 1959. The purpose that time was to repeat the exercise over the large new power stations coming into operation in the River Trent valley in Nottinghamshire. Unfortunately, the fog thinned out rapidly as the aircraft flew north from Heathrow and no useful results were obtained.

'Operation Chimney Plumes' stood down permanently in April 1959 and has never been repeated.

The author's modest role in the operation involved a frustrating, but less hazardous, journey across fog-bound London in the early hours of the morning in order to undertake liaison duties in the control room of Brunswick Wharf Power Station, which was the nerve centre of the operation.

The following pages give some technical details and photographs from the two flights on 28th October and 4th December 1958. Apart from one or two of the pictures, these details have not, in fact, been published previously — a curious omission in view of the crucial importance at that time of the 'Operation Chimney Plumes' study and the significant benefits that arose from its results. To explain this importance, it is necessary to recall the state of scientific knowledge and the areas of public concern, as they were in 1958.

AFTERMATH OF THE GREAT SMOG

It is unnecessary to describe to the readers of this journal the dramatic impact of the London Smog in 1952. The Beaver Committee Report on Air Pollution (Ref. 1) and the Clean Air Act of 1956 were among its direct consequences. Two important facts came to be recognised during this period:

(a) That domestic chimneys made a large contribution to urban air pollution.

(b) That severe pollution episodes, such as the 1952 Smog, are almost always associated with intense low level inversions in the atmosphere.

These factors are now so basic to UK air pollution control philosophy that it is difficult to recollect that, in the mid-1950's, they were rather novel and somewhat controversial. There were still many who tended to blame industrial emissions for most air pollution, or who failed to recognise the over-riding importance of meteorological conditions in determining the patterns of atmospheric dispersion. It was still commonplace to assess the contributions to ground level pollutant concentrations of different classes of emitter on the basis of their relative emission rates, with no allowance for differences in chimney height, etc. (Regrettably, there are many countries overseas who have yet to progress beyond this over-simplistic assumption.)

On this narrow basis, power stations and large industrial plants might be held to have contributed significantly to the 1952 Smog and to other similar episodes. Even the well-informed Beaver Committee came to the conclusion that they should recommend the widespread adoption of flue-gas washing at new power stations to lessen their impact on sulphur dioxide concentrations. With their experience of Battersea Power Station behind them, the CEGB (then the British Electricity Authority) were less convinced that this was the answer. The science of dispersion calculations was, however, still in its infancy. It was difficult to offer convincing proof that emissions from large tall chimneys behaved differently to those from small, low-level sources, to the extent that made their contributions negligibly small in urban smog episodes.

Even the magnitude of the thermal rise of hot chimney plumes was in question; the formula recommended by the Beaver Committee (now known as the 'Holland' formula) was strongly disputed by the CEGB on the basis of the practical observations then being made at power stations (Ref. 2). This early work on plume rise had lead to predictions of the height a power station plume might penetrate in strong conditions (Ref. 3), when the plumes from low level sources would be trapped in the stable layer and would accumulate to give high pollution concentrations. If the calculations were correct it would imply that even modest sized power stations would

send their chimney plumes clear of the low level smogs (which seldom exceed 500 feet in depth), to disperse harmlessly in the clear air above. 'Operation Chimney Plumes' was therefore planned to provide the visual evidence that would confirm this important conclusion.

RESULTS

On the two days of successful flights (28th October and 4th December 1958) the meteorological conditions showed interesting differences which are reflected both in the calculations and in the photographs obtained. On 28th October an anti-cyclone was centred to the east over the Low Countries and covered most of the British Isles. A cold front was approaching from the west of Ireland. Ground level temperatures in south east England were cool but not particularly low, i.e. around 8°C (45°F). Surface winds were calm or very light from the south east sector and were similar above the fog. Air temperature readings were taken from the aircraft during its ascent from White Waltham and are given in Table 1 (these were taken with the standard aircraft instrument and may not be wholly accurate but gave a good guide to the changes in temperature with height). The profile of temperature with height and its relationship to the observed height of the fog are depicted in Figure 1. The depth of the fog decreased substantially to the east and it disappeared altogether over the outer Thames Estuary. It can be seen that the profile within the fog was isothermal (i.e. the same temperature at all heights) but that a strong inversion existed above the fog up to a height of about 1,600 feet. The gradient of this inversion was almost +13°C (+24°F) per 1,000 feet.

The corresponding temperature profiles for 4th December 1958 are also given in Table 1 and Figure 1. On this day the anti-cyclone was centred to the west of Ireland with a ridge of high pressure extending over Southern England and into the Continent. A cold front was moving southward over Northern England. Surface temperatures in Southern England varied between 2°C and 5°C (35-40°F) and the surface winds were light and variable. Above the fog the wind was north-westerly and was light to moderate in strength. The fog was about 750 to 800 feet thick uniformly over the London basin. On this occasion the temperature profile showed a moderate inversion within the fog itself and an isothermal gradient above the fog to a height of 2000 feet or more, i.e. the reverse of the situation on 28th October. The gradient of the inversion within the fog was about +4°C (+7°F) per 1,000 feet.

Operational records from power stations in East London enabled estimates to be made of the heat content of their chimney plumes on the occasion of each flight (Table 2). A number of calculations were made by the late Geoffrey Spurr based on the method given in his published paper (Ref. 3) in which he estimated the vertical penetration of the plumes under the prevailing meteorological conditions. Because of the discontinuities in the vertical temperature profiles the calculations involved a laborious numerical integration method which is not described in detail here. Two calculations were made for each occasion;

(a) The heat content of the plume from a Brunswick Wharf stack that would enable it to penetrate to the observed upper surface of the fog.

(b) The corresponding heat content that would cause the plume to rise to a total height of 1,000 feet.

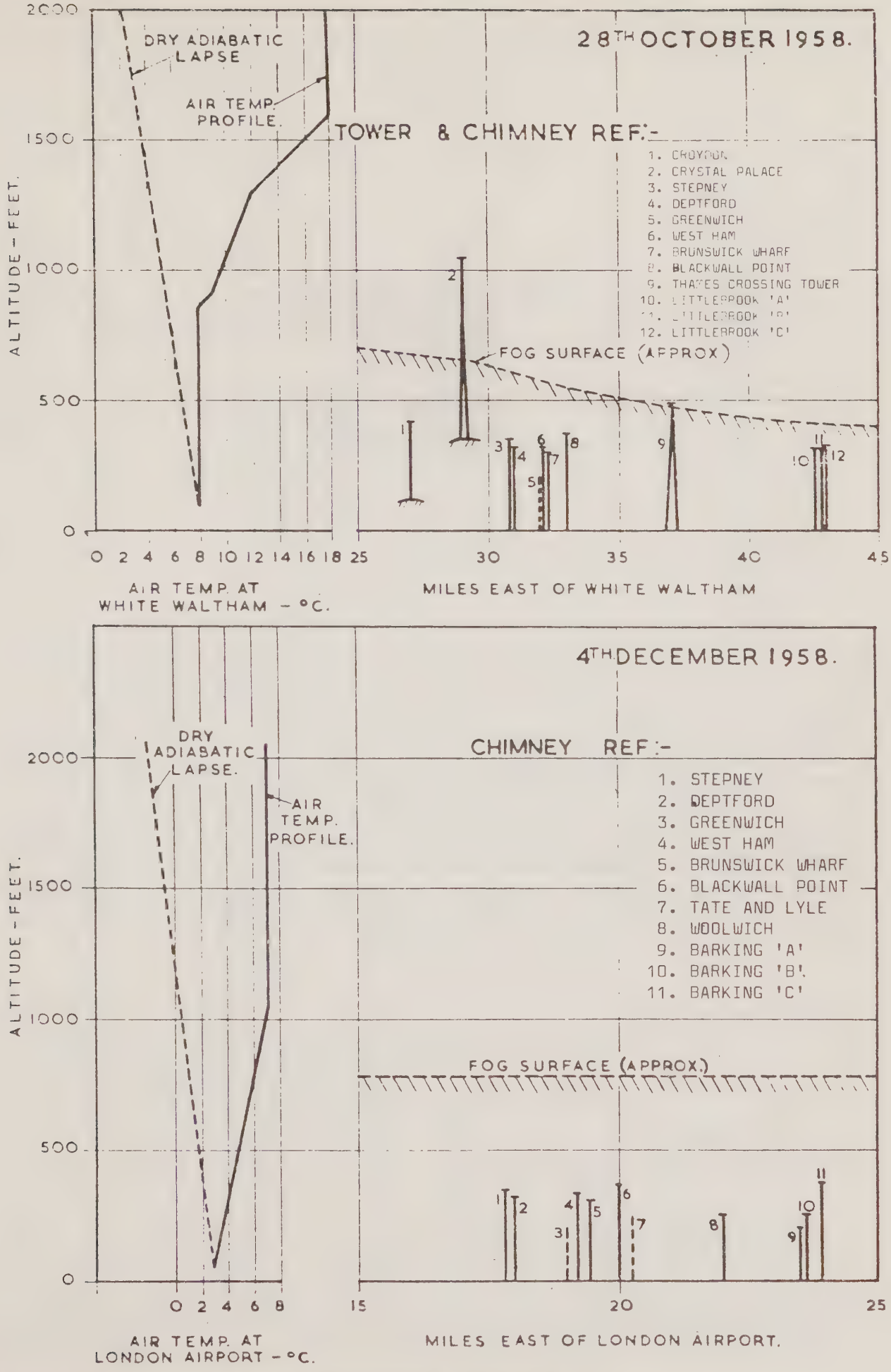

Fig 1 4th December 1958, temperature profiles

TABLE 1 Air Temperature Records

Height (Feet)	28th October 1958 (White Waltham 0820 hrs) °C	4th December 1958 (London Airport 0850 hrs) °C
Ground	8	3
500	—	5
750	8	—
800	9	—
1000	—	7
1200	12	—
1500	18	—
1900	18	—
2000	—	7
—		
5000*	—	4
—		
8000*	10	—

* Later readings taken over Central London.

The results of these calculations are given in Table 3 for comparison with the actual heat outputs in Table 2. On the basis of these calculations it would be expected that on both occasions the plumes from all the power station stacks in the area should readily penetrate the fog layer; particularly on 28th October when the stability within the fog was very weak. On the 4th December occasion several of the larger plumes should penetrate to 1,000 feet or more, i.e. several hundred feet above the fog surface, and thereafter should disperse in a normal 'coning' mode in the isothermal layer. In contrast, on the 28th October the rise of even the larger plumes would be severely limited above the fog and they would then disperse in the 'fanning' mode typical of severe inversions, i.e. with very little vertical dispersion. These expectations can now be compared with the photographs taken on the two occasions.

TABLE 3

	28th Oct 1958	4th Dec 1958
	million Btu/min	
1. Heat output/stack to penetrate fog layer*	0.02	0.14
2. Heat output/stack to reach 1000 feet.	7.37	0.84

* Assumed to be 600ft thick at Brunswick Wharf on 28th October and 775ft thick on 4th December.

TABLE 2 Power Station Chimney Heat Outputs

Station	Chimney	Height	28th October 1958		4th December 1958	
		Feet	*Load MW*	*Heat output m Btu/ minute*	*Load MW*	*Heat output m Btu/ minute*
Brunswick Wharf	East	300	142	1.65	170	2.05
	West	300	142	1.65	139	1.90
Blackwall Point	—	370	81	0.76	80	0.73
West Ham 'B'	1	325)	88	1.23	59	0.75
	2	325)			29	0.37
Deptford East	—	320	162	1.61	164	1.71
Littlebrook	2	315	50	0.66)	Not Photographed	
	3	315	80	0.91)		
	4	323	120	1.37)		
	5	323	35	0.40)		

Figures 2, 3 and 4 were taken on the flight on 28th October 1958. Figure 2 is a high level (approximate 8,000 feet) photograph looking south east from Central London towards the Isle of Dogs and the North Downs beyond, which emerge above the fog layer. The group of large plumes in the centre of the photograph include Brunswick Wharf, Blackwall Point and West Ham 'B'; the latter is most prominent as it includes the heat output from cooling towers as well as from the chimney. Other power station plumes seen in the photograph include Greenwich, Deptford and in the far right hand distance Croydon, also with cooling towers. On the original photo the top part of the BBC-TV mast at Crystal Palace can be discerned above the fog and this is shown more closely on Figure 3. Consultations with the BBC and the mast designers enabled the height of the fog at that point to be very accurately determined as 650 feet OD. Seen from above in Figure 2 the plumes downwind of the point of penetration (i.e. towards the camera) are barely discernible against the fog surface. There is however an indication of 'streakiness' in the photograph, possibly an effect of the hot plumes slightly modifying the fog surface layer.

Figure 4 is another high level photograph looking east down the Thames Estuary. In the centre of the picture, plumes from the four stacks at Littlebrook Power Station are clearly seen penetrating the fog and levelling off a little way above it. The plumes travel to the north west with very little vertical dispersion. A number of other plumes are seen beyond Littlebrook, probably originating from cement works, and several of these show similar 'fanning' behaviour. Close analysis of these and other photographs taken on the 28th October enabled the conclusion to be reached that the probable plume behaviour indicated by the calculations was both qualitatively correct and quantitative also, at least to a first order of accuracy.

On the flight of 4th December 1958 the positive identification of the Brunswick Wharf plumes by coloured smoke is clearly discernible in the photographs. Figure 5 shows the two enhanced plumes emerging through the fog layer and dispersing above it. Figure 6 is a close view of the point of emergence in which the nearer plume (the one coloured with red smoke) is seen silhouetted against the plume deliberately darkened by manipulation of the burners. The pattern of dispersion above the fog is the typical 'coning' behaviour associated with neutral or weakly stable conditions.

A similar pattern is seen in Figure 7, which shows the plume from Deptford Power Station well defined above the fog surface. A point of interest in this photograph is that the direction of the plume cuts at an angle across the wave-like billows of the fog surface, although it might have been expected that the orientation of the latter would also be determined by the wind direction. This may indicate a substantial shear in wind direction immediately above the fog surface.

A point of considerable importance that emerges from Figure 6, which was confirmed at the time by visual observation from the aircraft, was that the plumes from the two Brunswick Wharf chimneys emerged separately from the fog surface. Prior to this they had ascended some 500 feet from the level of the stack tops which are located about 300 feet apart. This clearly demonstrated the minimal mixing of the plume during its ascent and hence the minimal loss of polluting material into the fog. An approximate scale drawing of the situation is given in Figure 8 which also shows to the same scale emissions from domestic and small factory premises which were most likely to be trapped within the fog layer.

Fig 2 28th October 1958, top of fog — about 600ft OD, looking SE from Central London

Fig 3 28th October 1958, top of fog — 650ft OD or approx. 300ft above ground (Crystal Palace TV Mast)

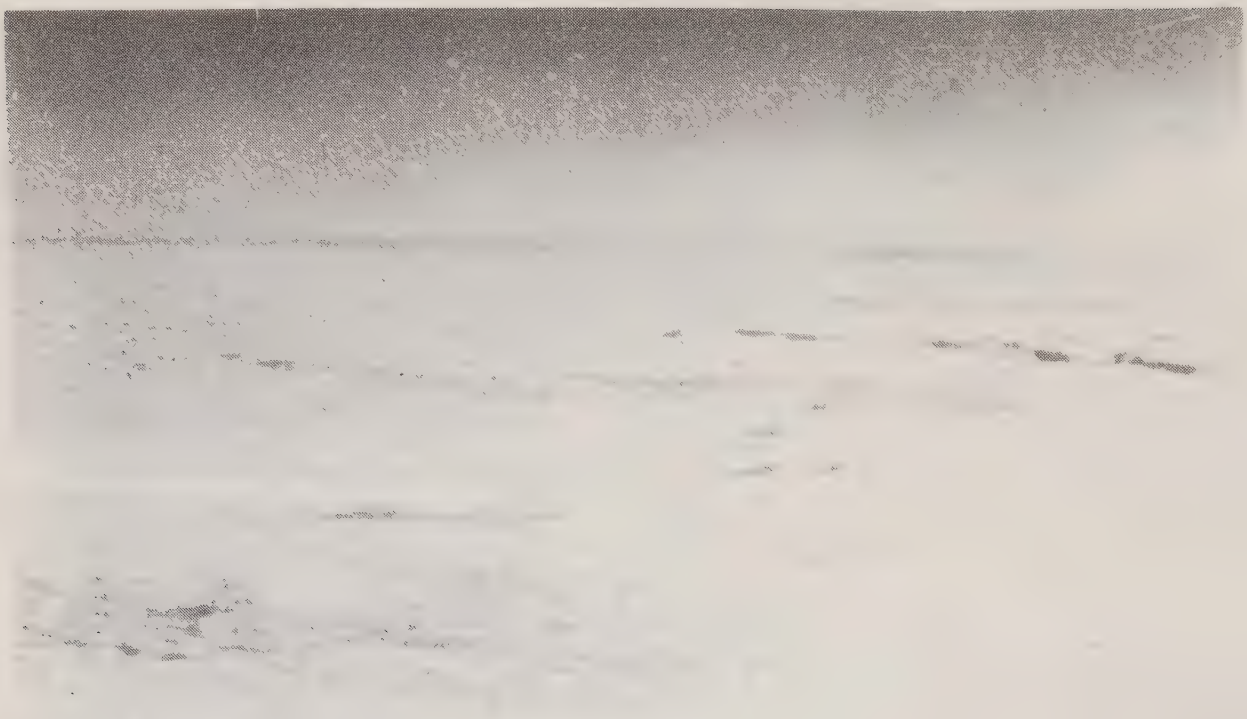

Fig 4 28th October 1958, top of fog — about 400ft OD (Littlebrook)

Fig 5 4th December 1958, top of fog — 750 to 800ft OD (Brunswick Wharf)

Fig 6 4th December 1958, top of fog — 750 to 800ft OD (Brunswick Wharf)

Fig 7 4th December 1958, top of fog — 750 to 800ft OD (Deptford)

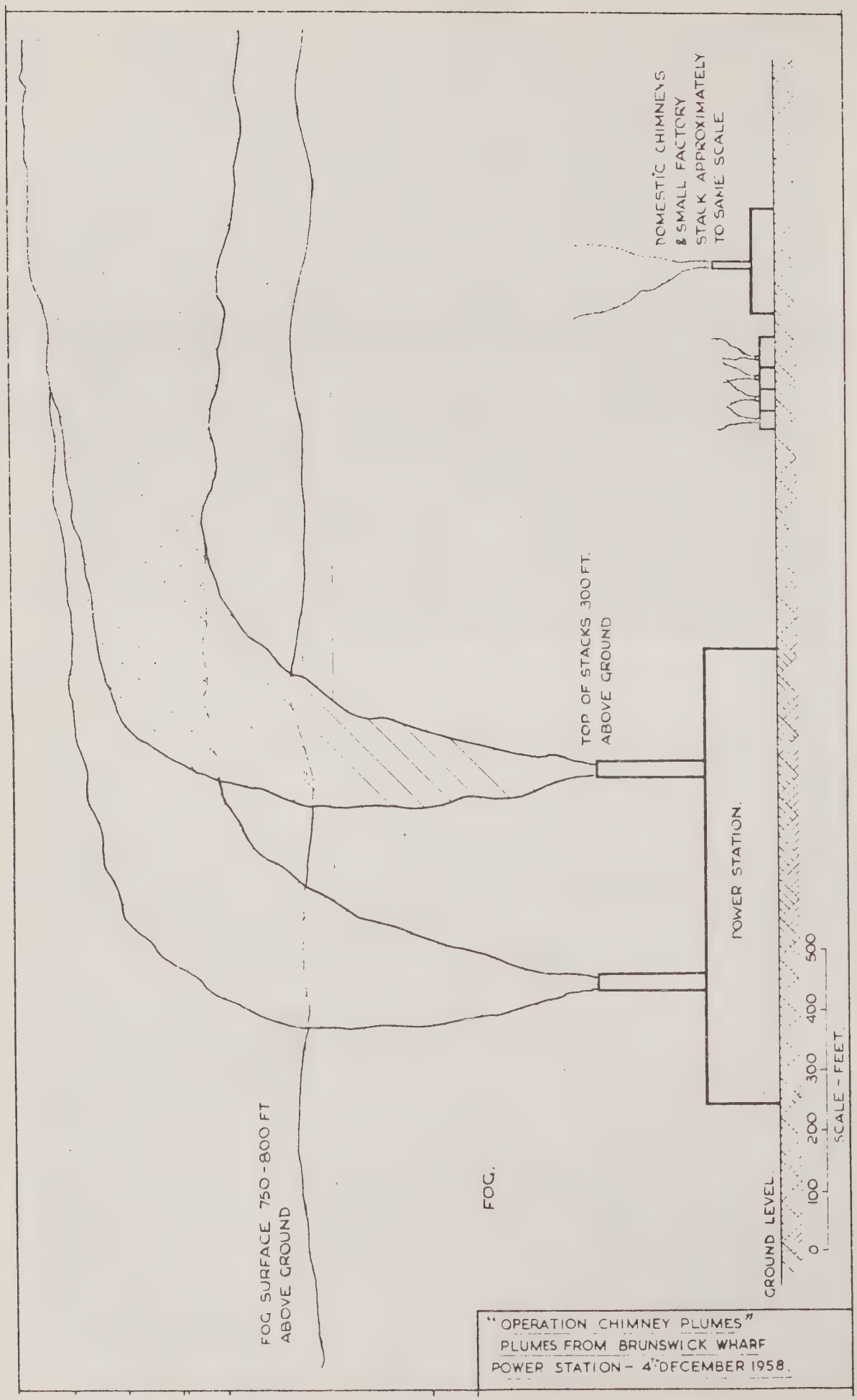

Fig 8 4th December 1958, plumes from Brunswick Wharf power station

The other photographs taken on 4th December showed fewer plume penetrations than on 28th October as the theory suggested should be the case. However after close analysis of the photographs the plumes from even the smaller power stations could be identified at the fog surface. There was however, one notable exception; on both flights a particular watch was kept for the plume from Bankside Power Station where the gas washing plant was in operation. No indication was found of this plume emerging nor was this really expected since the gas washing process considerably reduces the heat content of the plume. Even though 95 per cent of the sulphur dioxide was being removed by the washing plant the other 5 per cent unfortunately remained trapped in the fog and added to that from low level sources. Had the plume been emitted unwashed it would easily have penetrated the fog, most likely losing no more than 5 per cent of its SO_2 content on the way and probably much less.

IN RETROSPECT

About 70 photographs were obtained from the two flights and several weeks were required to analyse these thoroughly; to identify the plumes depicted; and to compare the visual results with the theoretical calculations. The outcome of the study gave considerable reassurance to the CEGB since it fully confirmed the conclusions they had reached on the penetrating power of large buoyant chimney plumes. A great deal of interest in the operation had been shown by a number of authorities concerned with clean air and there was a steady demand for copies of the photographs and for other information concerned with the flights. This interest has been maintained over the years; the author was asked only this summer whether some of the 'Operation Chimney Plumes' photographs could be made available to an overseas enquirer.

An opportunity to make use of the results soon arose. In the following year the CEGB applied for consent for a third power station on the Drakelow site near Burton-on-Trent. For the first time this would increase the total generating capacity of one site to over 2,000 megawatts. Before agreeing to the proposal, the Chief Alkali Inspector decided to conduct a thorough 'state of the art' review of the control of power station chimney emissions including all the research studies, site monitoring surveys and other investigations then in progress. The problem of pollutant accumulation in smog conditions was still uppermost in people's minds. The 'Operation Chimney Plumes' results offered the clinching argument that large power station chimneys added little or nothing to the pollution under such conditions and consent to the construction of Drakelow C Power Station was forthcoming.

In the years following the flights many power power stations of 2,000 megawatts or more have been approved and constructed. Pollution measuring instruments of great sophistication have been developed and used in surveys around these large plants. The results obtained have continued to confirm the results of the 1958 aerial survey and have demonstrated that in the meteorological conditions which give rise to the highest pollutant concentrations the major contributors (indeed, almost the only contributors) are the small low level chimneys of domestic and commercial premises.

It is difficult to overestimate the importance of this factor. The national smoke control programme has hinged on it and it has been directly responsible for

development of a UK air pollution control philosophy which regards the potential impact of a source on ambient pollution concentrations as being of greater importance than its rate of emission. This in turn has led to a reluctance in UK to follow the lead of other countries that have initiated pollution control programmes aimed primarily at power stations and other large industrial plants to the virtual exclusion of control over the small emitters. The cost-effectiveness of such policies remains in some doubt in the light of the considerable experience of these matters in UK, to which 'Operation Chimney Plumes' contributed an important quota.

These remarks are by no means intended to suggest that all problems with power station emissions can be solved merely by providing a chimney large enough and tall enough to ensure the plume will penetrate local smogs. This is only the first stage in the journey of a number of pollutants to their final destination in the environment. Over the years since 1958 attention has switched to the effects of emissions at greater distances and over longer timescales, with particular emphasis on the contribution of sulphur and nitrogen oxides to the acidity of distant rainfall. It is not the purpose of this article to discuss the latter problem but it may be of interest to note that the next phase in the CEGB investigation of acid rainfall again involves the use of an aircraft. As was found in the 1950s, there comes a time in many scientific investigations when it is necessary to take the laboratory to the problem rather than bring the problem to the laboratory!

Nevertheless, in the context of the concerns at that time 'Operation Chimney Plumes' provided a timely and very important contribution to scientific knowledge. It was a sombre thought, never far from the minds of those participating in the operation, that smogs in London similar to those over which Whiskey Charlie was flying had been associated with enhanced mortality and morbidity rates. Medical analysis following the smog of 4th December 1958 (Ref. 4) showed an increase in mortality of about 70 in the London area; the smallest increase associated with several pollution episodes that winter, but this smog did not persist long enough for pollution to accumulate. Medical statistics of this kind lent a degree of urgency to the investigation and there was inevitably a sense of relief in being able to show that electricity generation did not add significantly to the numbers. Quite possibly the reverse was true, to the extent that the availability of electricity supplies may have helped to reduce the burning of fossil fuels in domestic premises and hence reduce emission of pollutants into the smogs.

The successful outcome of 'Operation Chimney Plumes' thus enabled one major concern to be set aside and effort to be concentrated on other equally pressing problems of environmental protection.

ACKNOWLEDGEMENTS

Despite the time lapse of 21 years it is still a pleasure to recall the enthusiastic and highly professional co-operation of all the many interests involved in 'Operation Chimney Plumes'. In particular, the CEGB owe their thanks to Captain L. C. Hazard, First Officer H. Watt, Mr. F. J. Worton, and Mr. B. J. Attwell of Fairey Air Surveys Limited whose skills made the whole operation possible; to the London Airport controllers under their Senior Officer, Mr. Woodruff; and to the many duty officers, meteorologists and radio operators at the Airport, the Meteorological Office and the Ministry of Civil Aviation, who all contributed to its success.

Thanks are also due to the airworthiness of Whiskey Charlie which, together with sister Dakotas of Fairey Air Surveys Limited, is still flying! These aircraft are still occasionally used for flying trials as unusual as 'Operation Chimney Plumes'; such a chasing and measuring thunderstorms over India in connection with the Concorde project.

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INTERNATIONAL NEWS

IUAPPA Newsletter, Vol. 4, No. 22, October 1979

Air Pollution Control in the Soviet Union

Following a World Environment Report item which quoted a top Soviet environmental official as saying that despite wide spread government clean-up efforts, pollution continued to be a serious concern in a number of Soviet industrial cities, we have asked the Soviet Information Agency in London for comment on the air pollution situation and controls applied in the Soviet Union.

We were told that in general the level of air pollution in Moscow and other big cities is rapidly decreasing. Factories are being moved out to special industrial belts outside urban areas. Domestic emissions are not generally a problem in city areas as central heating is widely used. Problems anticipated with new factories are tackled at the design stage, and many new factories operate on a completely enclosed environmental system, with wastes being recycled. Tree belts are used around potentially polluting industries, as is done in the People's Republic of China. In Donetsk, a coal mining area, there is a special department of Industrial Biology dealing with the use of plants, flowers and trees to be deployed in belts around the factories.

Some problems however do remain and in the Azerbaidzhan city of Sumgait, the local party committee gave strict reprimands to a number of industrial managers who had been responsible for excessive pollution. Following these reprimands (and some dismissals) new anti-pollution systems were installed.

Ten years ago industry was responsible for the majority of pollution in city areas; although levels overall have fallen, there has been an increase in pollution from road vehicles. This problem is being tackled in two ways. First at the design

stage for new motor vehicles, and secondly by the increased use of non-polluting vehicles. Trolley buses are being introduced in several Soviet cities Experiments are also under way to investigate the use of'new' fuels for road transport — hydrogen, electricity, etc. New roads in city areas are being tunnelled and car parks are built under ground.

Enforcement of air pollution control is carried out by government inspectors. Monitoring is also carried out on site by trades union and labour safety officials who have wide ranging powers to deal with pollution problems. There is a policy of environmental training for the work-force.

Air quality is monitored and strict standards have been set: in many cases well above WHO guidelines. In the western part of the Soviet Union, including the Leningrad area, special standards are in force following an agreement among the States bordering the Baltic to restrict pollution levels in order to prevent high pollution incidents caused by drift of pollution across national boundaries. Soviet trades union officials have suggested to the Soviet Government that the Baltic protection area should be expanded.

Energy conservation is as much an issue in the Soviet Union as anywhere else. In a major speech four months' ago, industries were told to cut back on their energy usage and in order to encourage this, industrial fuel prices were raised. Domestic prices have remained static.

All in all it seems that the Soviet system for pollution control does not now differ greatly from other European industrial countries, although we cannot comment on how successfully the controls are applied. The general public is obviously awake to air pollution problems and people express their concern when necessary by sending critical letters to the press, radio and television. As at Sumgait, local party committees keep an eye on industrial activity in their area. In common with other countries, it seems that most air pollution problems are caused by old plant and imperfect control technology.

BOOK REVIEWS

Health and Safety. Industrial Pollution, 1977. *Health and Safety Executive, HMSO, 1979, £3 net.*

1977 was a period of industrial stagnation in many parts of the country; the Chief Inspector (England and Wales) reports that several industries approached the Inspectorate during that year to ask for a greater period of grace for the implementation of air pollution control requirements. A slower rate of implementation was allowed in some cases in order to keep works alive and staff in employment. However, the report states that the Inspectorate did not allow a reduction in standards of emissions and other requirements. Old plants kept active beyond the end of their normal working life presented particular problems in some areas, especially within the iron and steel industry.

The Inspectorate obviously had some sympathy for the difficulties that industry faced and made some concessions accordingly. However, in a paper submitted to the Trades Union Congress, which is appended to the report, Mr. Frank Ireland described

the expectations generally held of a high quality of life in the following terms: 'We receive far more complaints today from the public about far less pollution, compared with conditions even 10 years ago, when the situation was much worse. The public is more aware, better-informed, and more organised to complain through Residents' Associations and Anti-Pollution Groups and these bodies receive a sympathetic hearing from elected members of local and central authorities. It is right that the public should have this regard for their environment and should press for improvement.' So, the situation is that things have improved greatly in the last 10 years, but the public are more aware of the pollution that does exist, and that when in financial difficulties, industry is allowed some leeway by the Inspectorate.

In relation to the iron and steel industry for example, the Society received some complaints about an old plant which had indeed been kept active beyond its normal life span. Members of the public find it rather difficult to accept that a particular plant is going to continue to be a nuisance in their area until the economic situation improves sufficiently to allow that plant to be closed down. Very good liaison between the controlling authorities, the industry and the public is necessary to allow such an argument to carry the day. The Chief Inspector reports that 'The iron and steel industry has accepted that all new plants will be fitted with the full best practicable means from the outset', but as regards improvements to existing plants which were causing justified complaints during the year under review, there was felt to be room for argument as to when the extra equipment could be installed. The Inspectorate accepted some delays in the implementation of its requirements but 'improvements to emission control have been achieved at considerable cost'.

Electricity works also received a mixed report: 'There have been triumphs and disappointments at CEGB stations in preventing pollution of the environment, but on the whole the Akali Inspectorate can feel far from satisfied'. Although the areas of dissatisfaction are not specified, it is reported that major expenditure is planned to improve electrical precipitators performance at a number of power stations, and that a programme of priorities has been agreed for this.

Metal recovery works presented some of the greatest problems to the Inspectorate. There were 32 infractions, all but one being against works found to be operating without prior registration and without best practicable means. Local authorities drew illegal operations to the Inspectorate's attention and several districts reported an increase in illegal burning activities 'to the commercial detriment of bona fide registered works, a number of which had to close down'.

The Chief Inspector comments that the penalties for illegal operations are not apparently tough enough to discourage the practice. This is certainly true. The fines imposed after successful prosecution — sometimes as low as £50, usually around the £150 mark, with costs — are absurdly low in view of the pollution problem and the effort involved in catching and prosecuting these illegal operators.

Complaints against registered works received by the Inspectorate were most numerous against mineral works (97), electricity works (40), and iron and steel works (39). Complaints investigated by the Inspectorate against non-registrable works, at the request of local authorities, were most numerous against burning and incineration, organic chemicals and metallurgical works.

One of the most time-consuming industrial air pollution problems reported by the Inspectorate for Scotland was caused by a chemical incineration works. Prolonged dark smoke emissions had been occurring and herbage samples had shown a high metals content. The situation has now improved, and trees and hawthorn hedges which had been damaged by emissions during 1976 have recovered.

As usual this is an extremely interesting report with a vast amount of information about the work of HM Alkali and Clean Air Inspectorates. However, the report has appeared nearly two years after the end of the period under review, and it would have been interesting to see some prediction of trends in relation to the general economic situation. Industry is still beset with labour and financial problems, and although the Inspectorates will undoubtedly continue with the policy of not allowing any relaxation in its requirements for new plants, they may be faced with an ever-increasing burden of requests for a period of grace in implementing controls on older plants. Changes in the pattern of fuel use in industry will also present problems. The present Government's attitude appears to be that industry must have priority, and environmental considerations must take a back seat. If the public is as alert as Mr. Ireland suggests there will be a very mixed reaction to this policy and the authorities responsible for the control of industrial pollution could find themselves in an increasingly difficult position.

EFFECTS OF CHLOROFLUOROCARBONS — SECOND REPORT

The Department of the Environment have published their second report on chlorofluorocarbons and their effect on stratospheric ozone (Pollution Paper No. 15, DOE Central Directorate on Environmental Pollution, HMSO 1979, £4.74).

The report contains a detailed examination of evidence on ozone depletion by the Department's Stratospheric Research Advisory Committee (STRAC), a group of experts drawn from universities and research laboratories in the United Kingdom. The report reviews current policy and knowledge, outlines the global nature of the problem of ozone depletion due to CFCs and assesses the advances that have been made in the understanding of the situation in the past 2 years. Major advances have been made but the report says that many issues remain to be resolved. Improved laboratory data on the rate of chemical reactions in the stratosphere, increased sophistication of computer models, especially those showing latitudinal and seasonal effects, are needed, as are stratospheric measurements to test the validity of the predictions.

As has by now been widely publicised, the problem with CFCs 11 and 12 is that they have long lifetimes in the lower atmosphere and they are transported upwards into the stratosphere where they appear to be decomposed to yield active chlorine species which, according to laboratory studies, would catalytically decompose ozone.

STRAC has been undertaking modelling studies, two dimensional (altitude — latitude) as well as one dimensional, on the rates of ozone depletion. If their predictions are correct, they conclude that CFCs would have already reduced the stratospheric ozone by about 0.6-1.3 per cent. If all releases were discontinued immediately, reduction is predicted to reach a peak of about 2 per cent in 5-15 years time and would thereafter decrease over a period of 50-100 years. If releases

continue until 1982 this peak figure would increase by 0.5 per cent to 2.5 per cent. These results concur with other studies in predicting that reductions in the total ozone content are greater than had been estimated at the time of the preparation of the first DOE Chlorofluorocarbons Report.

Since the publication of DOE's first report on this subject (Ref. 1), the EEC have passed a resolution in 1978 expressing concern about the possibility of ozone depletion due to CFCs, and urging on the search for substitute propellants. This year the EEC made proposals to bring about, by 31st December, 1981, a 30 per cent reduction in the use of CFCs in aerosols, compared with 1976 levels. But because of the need to avoid barriers to trade, no EEC member state can take wholesale action on its own to ban the use of CFCs in aerosols. Britain must be in step with other EEC countries. DOE's second report stresses the need to reach an internationally agreed policy that will allow worldwide emissions to be limited. There are regulations in USA and Canada restricting the use of CFCs to essential purposes (i.e. for refrigerants and air conditioning plants and polyurethane foam), and in July 1979 Sweden introduced restrictions on the import and manufacture of CFCs except for specifically exempt purposes. A similar regulation is proposed for Norway.

The EEC countries account for 30 per cent of the total global consumption of CFCs, 70 per cent of which is for aerosol propellants (9 per cent on refrigerants/air conditioning; 19 per cent on flexible and rigid foam; 2 per cent on solvents). In 1977, the total EEC consumption of CFCs 11 and 12 was 233,000 tonnes, with 43,000 tonnes being used in the UK.

In 1974 the US consumption per capita of CFCs was almost double the per capita consumption in EEC countries, but the ban on CFCs in aerosols in the USA has resulted in a reduction of 50 per cent in production. In the EEC, use within the minor sector (refrigerants, air conditioning, foam, solvents) is increasing. There are great difficulties in recovering the CFCs during servicing or manufacture or destroying CFCs in the foam at the end of its useful life. The report recommends that codes of practice should be drawn up, to be implemented on a national basis, aimed at reducing emissions of CFCs in manufacture and servicing.

The report discusses substitutes for CFCs 11 and 12 and describes the work being done to test the toxicity of a wide range of possible substitutes. Using hydrocarbons as a replacement propellant presents difficulties including a shortfall of supplies of about 50 per cent. £10m worth of new plant will be necessary to fill the gap. For polyurethane foam, a substitute blowing agent would need to be found which would result in thicker foam or poorer insulation quality. Total removal of CFCs in foam production would result in a cost increase of about 25 per cent.

Should global emissions continue indefinitely at about the 1975 rate, the 2nd report concludes that a steady state would be reached with ozone being reduced by an amount between 11 and 16 per cent (according to the model used). Changes of the magnitude predicted are not likely to be detectable within the next decade but if the change is greater, earlier detect on may be possible; but even so, there will be no certainty that CFCs are the cause. There is great natural variability in stratospheric ozone, and because of the persistence of CFCs in the atmosphere any positive identification of their effects can only be made after a considerable lapse in time.

The report states that it is not realistic to consider global ozone reductions in terms of the effects of CFCs 11 and 12 releases alone. Many other factors, both natural and resulting from man's activities, may increase or decrease global ozone amounts. For example, increased emissions of CO_2 into the atmosphere due to the burning of fossil fuels and deforestation may significantly affect stratospheric ozone. Generally, decreases in stratospheric temperatures are believed to be linked to an increase in the ozone amount. The radiative-convective effect due to projected CO_2 increases could decrease the ozone reduction estimate by a factor of about 2 compared to that deduced when the CO_2 is held constant. So one type of emission might cancel out the effect of another to a certain extent.

The report concludes by stressing the importance of continuing research and for producing another review in 2 years time on the need for further reduction of CFCs. Michael Heseltine, Secretary of State for the Environment, emphasises in the foreword to the report that the problem is not specific to the United Kingdom or to Europe, but is a global issue. 'The United Kingdom will work together with its European partners on precautionary policy and will continue to play its part within the wider international setting.'

Ref. 1 Pollution Paper No. 5 'Chlorofluorocarbons and their effect on Stratospheric Ozone', 1976. Available from HMSO, £1.00.

LETTERS TO THE EDITOR

Dear Sir,

The letter from Dr. R. A. Stephens concerning lead in the environment (*Clean Air,* Vol. 9, No. 5, p.167) lists many well known reasons for being worried, but they do not add up to a quantitative assessment of the benefits to be obtained from various different efforts to reduce our exposure to lead.

My letter (*Clean Air,* Vol. 9, No. 3 p.92) was simply an attempt to point out that in so far as the work at Harwell on ingestion from the breath can be used for this purpose the indications are that the removal of lead from air breathed would reduce people's blood lead by 1 or 2 *ug*/100ml.

The point is not that this does not matter, but that the differences observed in the lead levels of different people will not be significantly altered by the removal of lead from the air and that the causes of the observed high levels above 60, and even the worrying ones above 30, will not be removed.

Dr. Stephens gives cases where there is important contribution directly from the air, but he does not say what the harmful effects are. I do not say there are none, but it is necessary to know what they are if we are seeking to remedy them. The fact that until lead mining began the natural level in most places, animals and vegetation was far below what it is today, does not in itself indicate a need to lower it. We simply are unable to manage pollution control on such a basis. If a remedy is proposed we must expect that the effort, organisation, and expense will produce certain benefits, and as far as lead is concerned it does appear that those who are worried about toxic effects of lead would be disappointed with the results if it were all removed from petrol because such a change seems incapable of producing the desired effect.

There are important areas of uncertainty still. The first is where does most of the lead in the air actually go to? Most probably it is rained out and eventually drained into the sea. Undoubtedly it contributes to the general environmental level in the soil, in vegetation, and in drinking water. But the difficulty is always the same when we come to quantify this: the amounts in local dust and soil vary far more than if they were due to such a widely dispersed aerosol as lead from exhausts. Furthermore, there are regions where the amount is so large that the air could not have been a significant source. For example, the roadways commonly used by vehicles and people on foot leaving a factory (e.g. for manufacture of batteries) where lead is used, often contain very many times as much as the neighbourhood while the amount distributed from the factory by the air is not detectable in the presence of this. Thus nearness to the factory matters only on one of these routes. Obviously street dust will affect some children more than others according to their habits, and with such children as suffer lead in petrol is trivial. But further certainty must be sought in this matter of where lead in air goes to.

A second area of uncertainty is the question of possible harm from levels which have hitherto been regarded as safe. This is a matter on which the rest of us are dependent on advice from the medical profession, and if they choose to lower the levels of safety we need to know whether they are playing safe with no new information, or on the other hand, whether we have a new issue to understand if we are going to have to change our priorities significantly. Dr. Stephens can be assured that not only has the Clean Air Council had fairly good order of magnitude estimates of the cost of doing without lead in petrol in terms of extra fuel used and extra capital refining equipment required, but has also been given by the medical profession a pretty good idea of the levels we should worry about and by the scientists concerned of the significance of their work on ingestion from the air. Lead pollution is a disagreeable field to be in because none of us is expert in much more than one field of science and all are involved and all contain uncertainties.

We feel that there are a few very serious outstanding problems in which effective action should be taken urgently. For example: the use of domestic lead piping in soft water areas (or the use of soft water in areas equipped with lead piping); the changing of lead worker's clothes before leaving the works (many lead workers' children have high blood lead levels because of the dust brought home); the removal or sealing over of old lead paint in housing areas built in, for example, Edwardian days with heavily leaded paint (it is not simply a question of children chewing the windowsill but of the dust generated when the paint flakes off with age: many of these housing areas are kept in a much worse decorative state than when they were built and this is a serious problem in US because of the great number of wooden houses extensively painted); good housekeeping at all lead works to remove prevalence of dust and prevent it being carried off the premises; and finally the use of lead cosmetics and culinary compounds by cultural minorities (this is not a silly problem or easy to solve because it is desired that we should prohibit the use of established customs and this appears to be discriminatory).

The way in which lead gets into us in our food is important. Why are we not continually advised, if it is important, not to eat or drink certain manufactured or bottled products, or vegetables from particular areas?

The governments of the West agreed to reduce lead in petrol because in the early 1960s there were quite fantastic predictions being made about the probable levels of traffic in the 80s and 90s, and the concentrations to be expected. Actually the lead levels have not risen although in some places they may remain at the levels achieved for a longer fraction of the day. We are now in a situation which is evidently quite new to many people, namely that because of growing fuel scarcity we are wondering how to keep the traffic going, and so the old problems, which also led to extravagant motorway plans, seem to have abated, and we are being moved towards higher (not lower) compression ratios in car engines to save petrol, and that means continued use of lead.

At this point, when we look at the situation in, say, 1990, the problem of environmental lead due to cars does not seem likely to be any worse than now, and it is to be hoped that most of the special problems like those mentioned above will have been largely cleared up. In every environmental field there are problems which different people regard as having different degrees of urgency, and so finally I would like to express my chief concern — resource scarcity and unemployment. Because these two scourges of this over-populated world are so menacing I think we have to look at the likely effectiveness of any expense to which we go in making the lush material life of the rich countries just that bit more secure for this rather spoiled generation.

But if Dr. Stephens or any one else can determine quantitatively the benefits which will accrue in the lead pollution scene if we get rid of it from petrol, and at what cost in that precious resource — fuel, we can reconsider it; but it does not seem to have a high demand on our resources according to present understanding.

Yours faithfully,
R. S. Scorer

Dear Sir,

Smoke Control

At its meeting held on 13th September the Derbyshire Advisory Council for Clean Air and Noise Control considered the possible effect on Local Authorities' Clean Air Programmes of the recent cuts in local government expenditure and resolved that Constituent Authorities of the Advisory Council be informed that it is the view of the Advisory Council that smoke control programmes should continue to form an important part of capital programmes.

The Advisory Council felt, however, that this was a matter of greater than local significance and I was therefore requested to inform you of the Advisory Council's resolution and ask you to encourage so far as you are able local authorities to continue to give priority to smoke control programmes.

Yours faithfully,
R. A. Kennedy
Honorary Secretary,
Derbyshire Advisory Council for
Clean Air and Noise Control.

INDUSTRIAL NEWS

New Chairman for Solid Smokeless Fuels Federation

Mr. John A. Brown has been appointed Chairman of the Solid Smokeless Fuels Federation, replacing the late Mr. F. L. Waring.

Mr. Brown has been a member of the Federation's Executive Committee since 1965 and was a Founder Signatory at the formation of the Solid Fuel Advisory Service.

A chartered engineer, Mr. Brown joined Midland Rexco in 1935, was appointed Mansfield plant manager in 1941 and Chief Engineer of the National Carbonising Company in 1951. Two years later he joined the Midland Rexco Board and was appointed Managing Director of Rexco Products Limited in 1955. His appointment as Managing Director of NCC in 1965 marked 30 years with the company.

Mr. Brown retired from his post as Group Managing Director in 1972, but remained a Director of the Group Board until 1978 and is still a consultant of the Company.

He is a Senior Fellow of the Institute of Energy, a Member of the British Institute of Management and a fellow of the Institute of Directors representing the latter body on the Mansfield Crime Prevention Panel.

Reader Enquiry Service No. **7973**

Aerial Thermal Heat-Loss Programme to be Launched by Fairey Surveys

New and improved Daedalus scanning equipment will pinpoint heat losses from Britain's public buildings and factories during a wide ranging aerial survey to be launched this winter by Fairey Surveys of Maidenhead. This new infra-red scanner is so sensitive that, when operated in an aircraft flying at 1,500ft, it can record temperature variations as small as 0.3°C. Heat losses from underground pipes, factory roofs and even domestic chimneys can, as a consequence, be detected with exceptional accuracy by this advanced equipment.

With the energy crisis now biting hard, the proven techniques of detecting heat losses perfected by this go-ahead Maidenhead company are being sought on an increasing scale by government departments and industry. Flights already arranged for the coming winter cover major cities such as Birmingham, Liverpool, Sheffield and Hull while other localities to be overflown include Folkestone and Eastbourne.

Companies using this service have reported most favourably on its cost effectiveness, potential savings of 10 per cent on annual energy bills as high as £30m having been uncovered by aerial heat surveys. All users have been impressed by the ease with which such surveys can be completed with no interference whatsoever to production.

To ensure good temperature contrasts and avoid the effects of solar radiation, heat surveys are normally undertaken at night. Heat losses are shown as white areas on black and white infra-red pictures but colour-coded pictures on which a scale of eight shades indicates intensity of heat loss are also produced.

Reader Enquiry Service No. **7974**

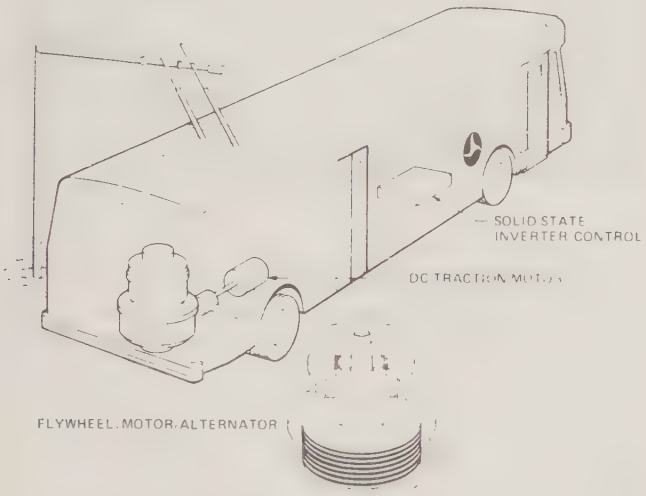
Pollution and Petroleum-Free Bus being Developed by GE (USA)

A pollution and petroleum-free bus — propelled by a 3,000lb mass of spinning steel — is now under development for urban transit by General Electric Company of the USA.

This development project is a major part of an energy conservation and propulsion technology programme for urban transit vehicles, jointly funded by the US Departments of Energy (DOE) and Transportation (DOT). With DOT, responsibility for this programme rests with the Urban Mass Transportation Administration (UMTA),

and UMTA has designated DOT's Transportation Systems Centre (TSC) in Cambridge, Massachusetts, as its systems manager. Under the four-year, $5 million contract awarded by TSC, GE (USA)'s Transportation Systems Division, Erie, Pennsylvania, will equip a full-size transit bus with an experimental flywheel-electric propulsion system. The programme will be administered and evaluated by TSC.

The heart of the propulsion system will be a ton-and-a-half flywheel fabricated from a stack of steel discs. Spinning at 10,000 rpm, the flywheel has sufficient energy to move the 28,000lb vehicle and a full payload of passengers up to 3.5 miles in stop-and-go city driving. The flywheel then can be re-energised at a kerbside charging station in just 90 seconds.



The key to getting energy into and out of the flywheel is a motor-alternator developed at GE (USA)'s Research and Development Centre in Schenectady, New York. Designed with a unique solid rotor that permits high-speed operation, the motor-alternator is attached to the same shaft as the flywheel. The motor-alternator adds energy to the flywheel by speeding it up or extracts energy from the flywheel and slows it down by generating electricity.

To reduce windage losses, the motor-alternator and the flywheel are sealed together in an 'energy storage module' that contains a low-pressure helium atmosphere. The components in the energy storage module can literally spin for hours while losing very little energy.

Each day prior to the first run, the flywheel will be charged up to its design speed. As the driver steps on the accelerator, electricity is extracted from the flywheel through the motor-alternator to power the vehicle's 150-hp electric traction motor. Then, when the driver steps on the brakes, the motor becomes a generator that helps to recharge the flywheel, squeezing out more miles between charge-ups.

After a number of stops to pick up and discharge passengers, the flywheel will have slowed to its base speed of about 5,000 rpm. The driver will pull to the kerb and extend power collectors from the bus to connect with the electric recharging station. In 90 seconds, the motor-alternator will spin the flywheel up to design rpm again, and the bus will be on its way.

The bus will be equipped with all the accessories required for passenger and driver comfort, including air conditioning, heating, interior lighting, and power brakes. A stripped version could have potentially double the range between charge-ups.

According to Allan Rayfield, General Manager of GE (USA)'s Transportation Equipment Products Department, 'The flywheel-electric bus offers most of the advantages of the electric trolleybus without the cost of installing and maintaining miles of overhead wires. The flywheel-electric propulsion system is clean, quiet, efficient, and totally free from the exhaust gases associated with petroleum-based fuels. In addition, it should offer long operating life and low maintenance requirements'.

'Another major benefit is that — unlike the battery powered vehicles now in use in some European cities — flywheel-powered buses can be recharged quickly and operated around the clock, while battery-powered vehicles often require many hours for a recharge'. Furthermore, the GE (USA) executive added, 'The need for

replacing expensive batteries is eliminated by the flywheel system, which will have a service life similar to a conventional bus'.

Reader Enquiry Service No. **7975**

Gas Cleaning System for Chalk Filtration and Drying Process

Peabody Holmes have recently completed a contract for the design, manufacture and erection of a gas cleaning system on a chalk filtration and drying process at the Newhaven Works of Artex Products (Manufacturing) Ltd. Chalk powder produced in the process is used in decorative finishes for both industrial and domestic use.

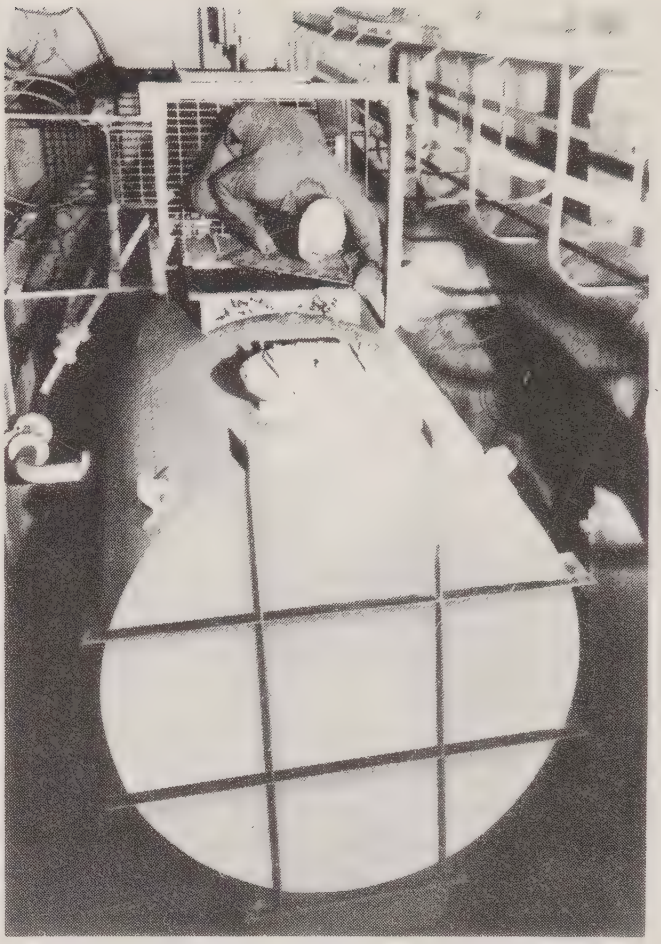
The system, which is installed after an attritor mill, comprises twin cyclones, a scrubber fitted with a venturi slot plate and impingement plate stages, a liquor recirculation system, fan and interconnecting ductwork.

The process gas flow of the gas cleaning system is 23,790m^3/hour containing 15 tonnes/hour of ground chalk, 70-80 per cent of which is made up of particles of less than 5 microns in size. The larger particles are removed in the cyclones whilst the remainder, down to the specified emission level, are removed in the scrubber.

In operation, gas entering the base of the scrubber is saturated with water and cooled to its adiabatic saturation temperature. The saturated gas passes through the venturi slot plate where fume and sub-micron particles agglomerate. These particles, carrying any residual dust, then pass to the impingement plates where intensive scrubbing takes place. The cleaned gas finally passes through a tangential vane eliminator where entrained liquid droplets are removed.

Tests carried out indicate that the required emission levels are being achieved.

Peabody scrubber installations are produced as comprehensive packaged units which can be individually designed to meet the specific pollution control requirements for many manufacturing processes. Large numbers of these highly efficient installations are in service in many parts of the world.



Reader Enquiry Service No. **7976**

Legislate on Insulation, says EHB Chairman

Legislation is urgently needed to improve the present 'appalling' standards of insulation in Britain's homes, according to Mr. Ken Rutland, Chairman of the Electric Heating Bureau, which represents the major UK manufacturers of domestic heating appliances.

Energy savings of 30 per cent were possible if the Government acted, he told a seminar on energy conservation and efficiency at the Building Centre in London in October.

'We have to realise that our standards of thermal efficiency are appalling, and urgent legislation is needed not only for new houses but to bring existing stock up to a much higher standard', said Mr. Rutland.

'Local authorities, housing associations and private owners only need education and advice, and perhaps some financial incentive, which might be as simple as being aware of the magnitude of the savings they will make'.

Once proper insulation standards were achieved, Mr. Rutland went on, together with other factors such as appliance controllability, 'domestically, a saving of 30 per cent is available if the will and the legislation and the policy is developed to help it along'.

He explained: 'The trick is to build a "tea cosy" and contain the energy, control it and only allow it to escape when it suits us'.

Mr. Rutland said that for the first time since 1973 there were real signs of a balanced energy policy emerging, and 'we are less likely to be concerned with the pennies in the difference in running costs between competing fuels and concentrate our abilities on ensuring that homes have the best possible chance of being economically viable and comfortable in the years to come'.

The Department of Energy have published a new guide to energy saving in the home, entitled 'Make the Most of Your Heating'. This is available free from P.O. Box 702, London SW20 8SZ. The 20-page guide offers practical advice to householders on ways to get maximum value from their use of energy. There are illustrated instructions on insulating water cylinders, lofts and floors, draught-proofing windows and doors and improving radiator efficiency. Also included is advice on cavity wall insulation, double glazing, thermostats and time switches. The information in the guide is applicable to all homes and heating systems.

Reader Enquiry Service No. **7977**

EMCEL Filter won't be Sneezed at

A Emcel Circaframe particulate filter, manufactured by Machine Control Limited, Blatchford Road, Horsham, West Sussex, is being fitted as standard equipment on

every Type 262, 272, 285 and 2100 British Leyland tractor supplied to Sweden and Finland, in order to satisfy those countries' regulations for the protection of farm employees. The filter is available as optional equipment on all these Leyland tractors, for use anywhere in the world.

The Emcel Circaframe filter is fitted to the cab fresh air heater intake which is located between the tractor engine compartment and the cab. Warm air from the engine compartment is thus effectively filtered as it flows into the cab. The filter removes fine particles of dust, chaff and pollen from the cab air supply.

Circaframe filters are available in a range of circular and rectangular panels up to 83in by 47in, and are manufactured by a process which involves the use of specialised and patented thermoplastic bonding equipment. Dependent on the type and grade of filter medium, efficiencies up to 96 per cent on particles down to 5 micron are easily achieved, with dust holding capacities up to 97 per cent by volume. They form part of a comprehensive range of particulate and activated carbon filters manufactured by Machine Control for removing solids, gases and odours from air in a vast range of applications.

Reader Enquiry Service No. **7981**

New Effluent Control Plant for ICI Severnside

The installation of a new effluent control plant has recently been completed by Jordan Engineering of Yate at the ICI Severnside works. The additional plant and equipment is connected to a 400ft effluent stack handling tail gas from nitric acid manufacturing. The purpose of the new plant is to reduce the level of nitrogen oxides which colour the discharge and to improve the efficiency of the energy recovery.

Jordan Engineering were responsible for the manufacture of the plant, associated ducting and support steelwork as well as assembly and installation on site. The plant consists of a tail gas stream heater, tail gas reactor, turbine and bellows units. These are installed on the exhaust side of the nitric acid manufacturing plants so that the tail gases pass through a numer of stages prior to emission. They are first proportionally mixed and heated by steam to a normal operating temperature of 200°C at 60 psig. The heated mixture is then subjected to a chemical change in the catalytic tail gas reactor. The discharge reaches an operating temperature of 377°C and some of this additional energy is recovered by an in-line turbine before exhausting through the effluent stack.

Although the effluent discharge prior to modification was within the presumptive limits, the new plant was ordered by ICI in line with their policy of adopting the best control of airborne emission.

Jordan also provided a steeplejack team to carry out modifications to the existing effluent stack.

Reader Enquiry Service No. **7982**